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ABSTRACT

An Illinois project identified new and emerging occupations within the state and determined the types, levels, and distribution of new vocational education curricula needed to meet employment demands for skilled workers in those occupations. Project staff reviewed similar national research efforts, recently enacted Illinois legislation, and technical and trade journals to identify potential new occupations. Telephone contacts were made with over 450 individuals nationwide, representing industries, educational institutions, professional and trade associations, government agencies, labor unions, service organizations, and private employers. Study findings identified seven new and emerging occupations for which new curricula should be offered: biomedical equipment technician, industrial hygiene technician, podiatric assistant, therapeutic recreation technician, swine confinement facility assistant manager, solar energy technician, and halfway house resident manager. Each was described in terms of job duties, educational requirements, typical employers, present sources of workers, linkages with established occupations or industrial sectors, and current and projected estimates of statewide manpower demand. (A curriculum planning and resource guide for each occupation is available separately. See Note.) Further, twelve occupations were identified as potential new and emerging occupations, due to pending legislation, technology, or borderline demand estimates. (Job duties and exclusion criteria are provided for approximately forty occupations which did not qualify.) (YLB)

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CURRENT AND FUTURE EMPLOYMENT OPPORTUNITIES IN NEW AND EMERGING OCCUPATIONS WITHIN ILLINOIS

Final Project Report

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NATIONAL INSTITUTE OF EDUCATION

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FOREWORD

The Vocational Education Amendments of 1968 provided that Federal funds could be used for "projects in the development of new careers and occupations" (Sec. 132). Most States have experienced a persistent and pressing need for information on new and emerging occupations. In response to such a need, the Illinois State Board of Education awarded a contract to CONSERVA to identify new and emerging occupations within the State and to determine the types, levels and recommended geographic distribution of new vocational education curricula which were needed to meet the demands for skilled workers in those occupations.

Occupations which could be potentially considered as new and emerging were first identified by a review of recent studies conducted at the national level and by other States. Recently enacted Illinois legislation and policies were also reviewed in order to determine their potential impact on the creation of new and emerging occupations. Occupational areas which showed promise for new and emerging occupations were linked to public and private agencies and organizations which would likely be most aware of new and emerging occupations within the State. Telephone contacts were then made with these organizations in order to collect specific information on occupational trends within the State. Over 450 individuals were contacted, representing industries, educational institutions, professional and trade associations, government agencies, labor unions, service organizations and private employers.

Each occupation identified through the survey was described in terms of job duties, educational requirements, typical employers, present sources of workers, linkages with established occupations or industrial sectors, and current and projected estimates of Statewide manpower demand. Existing data sources were then identified which could be used to derive estimates of sub-state regional demand for each new and emerging occupation. By having each new and emerging occupation linked to related occupations, types of employers, industrial sectors or other related data, it was possible to project the demand for the new and emerging occupations on the basis of anticipated growth in more established segments of the economy or labor force within Illinois.

The results of the study indicate that there are seven new and emerging occupations within the State for which new vocational education curricula should be offered. Additionally, there are twelve occupations, which, because of pending legislation or technology or borderline demand estimates, are identified as potential new and emerging occupations. Recommendations are provided concerning the specific steps which should be taken toward developing appropriate curricula for those occupations across the State.

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I. INTRODUCTION

Background

In the past 10-20 years, rapid advances in technology, changes in the social system and an emphasis on the environment have had a drastic impact on the occupational structure. The resultant emergence of new occupations has had a two-fold effect on the vocational education planning process:

- Educators have experienced difficulty in keeping abreast of changing labor market characteristics, and as a result,
- Vocational programs often fail to reflect the demand for new and emerging occupations.

This problem has not gone unrecognized; rather, in the past decade it has come under increasing consideration. The need for information on changing employment requirements to use in program planning was acknowledged in the Vocational Amendments of 1968 which authorized funding to States for use in research and development of new careers and occupations (Sec. 132). The Amendments also provided for " . . . assistance to State and local educational agencies in the development of curriculums for new and changing occupations, and to coordinate improvements in, and dissemination of existing curriculum materials" (Sec. 189). The necessity for current information on occupational opportunities was reiterated in later legislation. The Education Amendments of 1976 mandated the development and implementation of occupational information systems to meet the needs of vocational education and employment training programs at the national, state and local levels (Sec. 161). Further support was additionally provided for new and changing occupations through a continuation of funding for research, development and dissemination of curricular materials (Secs. 131 & 133.).

The Problem

National curriculum research and development efforts for new and changing or emerging occupations predated the 1968 Amendments. Beginning in 1966 the Technical Education Research Centers (TERC) was awarded a series of contracts by the U.S. Office of Education (USOE) for national program development in four new and emerging fields: biomedical equipment technology, electromechanical technology, laser/electro-optic technology and nuclear medicine technology (TERC, 1974). A later study was sponsored by the USOE for purposes of developing procedures for the identification of new and emerging occupations and implementing the methodology at the national level (Meleen, et al., 1976).

Pervasive throughout these investigations was a recognition of the difficulties in aligning state and local vocational education programs with new and emerging occupations. Traditional curriculum development for vocational education involves three basic steps:

- Analysis of student needs and labor market demand;
- Task analysis of existing jobs and identification of student competencies needed to perform these tasks; and
- Development of curriculum to provide training for the competencies required (Nelson, 1978).

These steps are not easily followed in the case of newly emergent occupations. Occupational functions are often hazily defined during the process of evolving; thus, employers tend to disagree as to the duties required and whether they actually comprise a distinct occupation. This creates problems not only for the identification of new and emerging occupations but also for developing or locating curriculum materials. Additionally, conventional procedures for estimating employment demand are generally not applicable to new and emerging occupations.

For example, traditional employer surveys are generally insufficient for identifying new and emerging occupations. Non-standardized definitions create problems of comparability between employers as to what constitutes a new or emerging occupation. Furthermore, new and emerging occupations are so widely dispersed across fields that anything short of a complete census risks missing significant numbers. Data produced by the Department of Labor such as the Occupational Outlook Handbook and the Dictionary of Occupational Titles are also of limited utility in the identification of and estimation of demand for new and emerging occupations. Occupational classification systems used by these sources are designed to reflect the existing occupational structure, thus ignoring those that are newly emergent. Additionally, these sources are nationally oriented and thus provide little information in regard to State and local employment needs.

Results obtained in the study conducted by Meleen are likewise of limited use in identifying State and local training needs for new and emerging occupations. The occupations identified in that study were restricted to those which met nationwide demand and educational criteria; i.e., 2000 openings per year for the next five to ten years and no available public vocational training programs. As a result a number of the occupations identified may not be relevant to a particular State's needs. Conversely, occupations new and emerging from a State's perspective may have been overlooked by the investigators because of vocational programs in other areas of the country or insufficient demand to meet national criteria.

Much of the difficulty in identifying and assessing the employment needs for new and emerging occupations is inherent in the processes by which they emerge. Generally occupations do not emerge suddenly. Rather they go through a variety of developmental or evolutionary stages. In the first stage of the developmental process new tasks begin to be subsumed within an old occupation and workers in established occupations begin to assume these duties on a part-time basis. Then, with increased need for the new skills or services, the tasks split away from the established occupation and comprise a new occupation. Eventually, provided that the value of the occupation becomes recognized, the demand is heightened and more and more individuals begin to perform the tasks on a full-time basis.

This process poses problems in defining when and if an occupation has emerged. Some occupations evolve very quickly in response to such forces as a crisis situation or a new technology. For example, it was estimated that 15 new occupations were created over a period of a week during the first energy crisis (Nelson, op. cit.). Similarly five new occupations were reportedly created by the development of the

crystal industry (Meleen, op. cit.). However, it would not have been wise to establish training programs immediately for these occupations. Crystal manufacturing occupations are being replaced by automation. The effects of a crisis situation may likewise by short-lived. Thus, the problem is one of defining at what point in the emerging process intervention by vocational educators is appropriate. Developing curricula too early risks a waste of time and resources, yet an overly conservative approach risks lost opportunities for both students and employers.

A partial solution can be obtained through continual monitoring of the more obvious forces which impact on occupations. Occupations generally emerge in response to a number of social, economic or environmental needs and forces. For example, many new health occupations are arising out of the recognition of quality health care as a human right. Similarly, environmental limitations are forcing the development of alternative sources of energy and concurrently new occupations. However, these forces are mediated by such factors as the state of the art in technology, legislation, environmental and human resources, and consumer interest. Advances in the computer industry, which over the past 20 years have created a number of new jobs, have served to satisfy a great many social, economic and environmental needs. However, without considerable investment of human resources and the appropriate level of technology, the advances would not have occurred. Likewise, legislation has reacted to needs and has created or inhibited the growth of occupations. For example, occupations whose functions serve to monitor the work environment have arisen out of national legislation. On the other hand, the use of new auxiliary health personnel has been slowed by both State and federal laws.

Though patterns of emergence can be identified and mapped and forces can be monitored, the variety of processes which impact on occupations preclude the development of a model which can be generalized to all occupations. An occupation may emerge simultaneously in a variety of settings in response to different needs. As a result, individuals performing the same duties may carry different job titles, and it is not until the occupation becomes established that the commonalities are recognized. Additionally, the forces affecting emergence often interact and are far from predictable. New technology may generate legislative control. Likewise, environmental forces may induce legislative action which in turn requires new technology. Furthermore, indicators of change such as legislation and technology are not easy to locate. Thus, although much information can be gained from being aware of processes, this also is not sufficient to identify new and emerging occupations.

The Purpose

In recognition of the importance of providing training for new and emerging occupations and in response to the current lack of information suitable to state-wide needs, the State of Illinois awarded a contract to CONSERVA, Inc. of Raleigh, North Carolina. The purpose of the project was to identify new and emerging occupations within the State and to determine the implications for curriculum development.

Pursuant to this goal CONSERVA recognized that the identification of new and emerging occupations requires:

- Consideration of the variety of forces and processes which impact on occupations;
- A flexible and multi-faceted approach; and
- Ingenuity in utilizing existing data sources to estimate sub-state demand.

Recognition of the forces and processes which contribute to the emergence of new occupations provides a starting point in the identification process. Though knowledge of these factors is not sufficient to identify new and emerging occupations, it does provide focal areas for investigation. A flexible and multi-faceted approach is required to account for the variety of ways and means through which occupations emerge. Tapping different sources of information provides for a sound data base regarding new and emerging occupations. For example, relying solely on information obtained from a sample of employers provides an incomplete view. However, when this is supplemented by information from associations, educators, employers, journals, occupational data bases, etc., different perspectives converge to afford a more complete picture. Additionally, the inclusion of these types of information sources in the identification process provides for greater acceptance and thus usability of the results by employers, educators and students.

Thus the identification of new and emerging occupations requires a methodology as complex as the emerging process itself. It requires establishing a network of communication among individuals representing all facets of change. Such a methodology serves to account for limitations in existing information sources, the processes by which occupations emerge, the different settings in which they emerge, and the variety of forces which impact on their evolution.

A description of the methodology employed by CONSERVA in the identification of new and emerging occupations and the estimation of labor market demand is presented in the next chapter of this report. Chapter III reports the findings and includes self-contained descriptions of all occupations investigated during the course of the study. Chapter IV presents the implications of the results of the investigation and provides recommendations to the Illinois State Board of Education.

II. PROCEDURES

The approach utilized in this study expanded on a methodology developed by Meleen and others (op. cit.) under a contract from the U.S. Office of Education. Data collection activities consisted of a series of iterative deductive and inductive steps which ultimately identified new and emerging occupations in need of vocational education programs within Illinois.

Prerequisite to this process was the necessity for developing a rationale for defining new and emerging occupations. For the purposes of this study new and emerging occupations were defined as occupations which met the following four criteria:

1. The occupation has come into existence within the past decade;
2. The occupation is skilled or technical in nature, requiring at least six months of vocational education preparation but less than a four-year college program;
3. There are no or limited vocational education programs within Illinois which are preparing students to enter the occupation; and
4. Information is currently available which reflects an anticipated shortage of workers within the State over the next five years.

The time frame was chosen to limit the scope of the study to occupations which have emerged in the last decade. It was felt that ten years would allow adequate time for new occupations to become visible but not yet be established in terms of available training mechanisms. Because occupations do tend to emerge at different rates this criterion was treated flexibly throughout the study, with decision-making relying more heavily on evidence of need. The second criterion was designed to assure that occupations identified were within the training confines of vocational education. Occupations requiring less than six months of education were considered more suitable to employment training. Those that require a baccalaureate degree were likewise not considered within the purview of vocational education. The final two criteria were interrelated in that they were selected to serve as indicators of need; that is, whether a vocational program would provide some benefit to students and employers across the State. The fact that there are limited vocational program offerings in a specialty indicates that there is a potential need for curriculum development. The fact that there is evidence of employment demand justifies offering training for that occupation. The demand cut-off stipulated by the Illinois Office of Education for the purposes of this project was 20 openings per year over the next five years.

The procedures for identifying new and emerging occupations involved three major steps:

1. Locating candidate occupations;
2. Obtaining occupationally relevant information; and
3. Evaluating candidate occupations against new and emerging criteria.

In order to account for the wide variety of forces impacting on the emergence of occupations, the approach selected to locate candidates was multi-faceted in nature. Each facet of the approach was aimed at identifying organizations knowledgeable of new and emerging occupations, either through linking organizations to trends in legislation and technology, occupations identified in previous studies of this nature or vocational program areas. The second step involved contacting or reviewing a number of different types of sources to obtain information necessary for evaluating the candidates. The third step essentially constituted a decision-making process. Information collected on each of the potential occupations was utilized to classify the occupations based on how well they satisfied each of the new and emerging criteria. While these three steps were frequently conducted concurrently during the course of the study, the process is clarified by discussing each separately.

Locating Candidate Occupations

Occupations that were potential candidates for consideration as new or emerging were located through a variety of methods — a review of literature on new and emerging occupations, identifying recent trends in technology, reviewing occupationally relevant legislation and conducting a survey of a sample of organizations considered knowledgeable of occupational changes. Each of these methods served to identify candidate occupations for further investigation.

The review of previous research on new and emerging occupations uncovered a number of candidate occupations. A primary source in this facet of investigation was the national study by Meleen, et al. (op. cit.). That study considered 100 occupations, eleven of which were defined as new and emerging. Each of the eleven, in addition to occupations rejected using nationwide criteria but regarded relevant to Illinois, were considered for follow-up. Also, areas where the U.S. Office of Education and the Illinois State Board of Education have recently funded curriculum development activities (i.e., the TERC studies, op. cit., and solar energy and coal mining occupations, respectively) were included in the investigation.

The second means of obtaining focal areas for investigation was the identification of trends in legislation and technology. The potential effects of legislation on occupations in Illinois were ascertained through a review of recent State legislation and meetings with Legislative Council and Staff members. Also considered were the provisions of the U.S. Education Amendments of 1976. A complementary analysis focused on technological trends. A review of technological and trade journals was conducted to isolate those technological innovations with potential impact on occupations.

The final means of identifying candidate occupations was a survey of organizations. The infeasibility of conducting a comprehensive survey was previously noted; thus, a sample of organizations/agencies was chosen to represent each of the five Illinois vocational program areas: applied biological and agricultural occupations; business, marketing and management occupations; health occupations; industrial-oriented occupations; and personal and public service occupations. Twenty organizations, representing those knowledgeable of new and emerging occupational trends in industry, education or the professions, were selected within each of the program areas. In sampling the organizations

care was taken to assure comprehensive coverage. In this regard use was made of information related to technological and legislative trends and input from staff consultants of the Illinois Department of Adult, Vocational and Technical Education (DAVTE). Each of these organizations was then contacted by telephone in an effort to locate new and/or changing occupations. A copy of the interview guides used in this facet of the approach is contained in Appendix A-1. A review of these guides illustrates that, in addition to supplementing the list of candidate occupations, the survey served to broaden the network of contacts and oftentimes elicited occupationally relevant information.

Obtaining Occupationally Relevant Information

The first step in obtaining occupationally relevant information was the identification of informational sources. Candidate occupations derived from the literature were linked to organizations considered knowledgeable; e.g., associations, employers and educational institutions. For those occupations identified through the program area survey, further contacts were generally obtained in the course of the survey. These organization/individuals were then contacted to elicit data on job duties, training, employers, sources of workers and demand for each of the candidate new and emerging occupations. (See Appendix A-2 for a copy of this interview guide.) Additionally, published materials (e.g., occupational data bases, job descriptions, curriculum materials and manpower projections) supplemented information gained in the survey.

Demand and growth estimates obtained through these interviews were supplemented with alternate projections. Where possible, linkages to established occupations or industries were obtained. This allowed the *Illinois Manpower Projections* produced by the Governor's Office of Manpower and Human Development to be used for estimating regional breakdowns of future demand. In these cases projection of the regional demand for new and emerging occupations could be estimated directly based on linkages with a parent occupation and existing projections of the demand for that parent occupation. For example, if each professional in a particular field requires two technician-level personnel and projections of the employment growth of the professional are available, the demand for technicians can be estimated based on the two-to-one ratio. When suitable linkages were not available alternate procedures were employed. In some cases growth rates of a related class of occupations were utilized to project demand. Use was also made of alternate State or national statistical summaries and the subjective estimates obtained from the interviews. A more complete description of the estimation procedures used for each occupation is presented in Appendix B.

Evaluating Candidate Occupations against New and Emerging Criteria

The purpose of this step in the identification process was to compare occupational information gained through the variety of sources discussed above and to decide whether the occupations investigated qualified as new and emerging according to the project definition. However, during the course of this study it became apparent that new and emerging occupations do not constitute a dichotomous phenomenon. That is, characteristics of the emerging process often preclude the simple classification or occupations as new and emerging or not new and emerging. Also, evidence regarding the four criteria for new and emerging is stronger for some occupations than others. In some cases employment demand was readily estimated using existing data, while for other occupations linkages were not easily established. For example, some occupations are too new to display adequate demand for immediate curriculum development, but offer potential for the future. To accommodate those occupations which exhibit promise but lack solid evidence to be classified as new and emerging, occupations were grouped into three rather than two categories:

- Occupations which qualify as new and emerging;
- Occupations which possibly qualify as new and emerging; or
- Occupations which do not qualify as new and emerging.

It was felt that by including the "possibles" category, Illinois would be provided the maximum amount of information for use in present and future curriculum development activities.

In summary, the identification procedure involved creating a network of informational sources. The approach was iterative in nature, simultaneously narrowing the scope of investigation and opening new areas for study. Occupations were continually evaluated against the four new and emerging criteria; once grounds for rejection were established, an occupation was quickly excluded from further surveying, thus allowing for a maximum amount of time to be spent on other candidate occupations. Program area interviews, on the other hand, identified numerous potential new and emerging occupations which were subsequently pursued through a series of occupational interviews. And so the process continued, until the data base was no longer expanding through the addition of occupations and no longer contracting by the deletion of occupations. The survey process thus facilitated both the comprehensiveness of the study and the zeroing-in on the appropriate contacts. For example, if the organization contacted was unable to provide the information requested, it generally knew of at least one individual who could. Program area interviews also broadened the scope of contacts both within and across areas. Likewise, the interest, cooperation, and particularly the breadth of knowledge displayed by the participants contributed to the success of the survey. Over 450 individuals were contacted, representing industries, educational institutions, professional and trade associations, government agencies, labor unions, service organizations and private employers. A listing of the organizations that participated in the survey is provided in Appendix C. The next chapter of this report presents the findings of the investigation.

III. FINDINGS

Seven occupations were identified which qualified as new and emerging:

- Biomedical equipment technician;
- Industrial hygiene technician;
- Podiatric assistant;
- Therapeutic recreation technician;
- Swine confinement facility assistant manager;
- Solar energy technician; and
- Halfway house resident manager.

These occupations are described in terms of job duties, educational or training requirements, typical employers, sex barriers, wages and hours, present sources of workers and regional employment demand. Additionally, sources of further information are provided.

Twelve occupations were identified which have potential but for which the evidence was incomplete to permit classification as bona fide new and emerging. For these occupations information is provided on job duties, education requirements and employment outlook. Forty-five occupations were considered and excluded because they did not meet one or more of the criteria for new and emerging. Exclusion of these occupations from further consideration in this project should not be construed to imply that these occupations have no programmatic implications. For example:

- Occupations which are new may still evidence sufficient demand to warrant additional program offerings;
- Training for occupations which require little or no formal education may be conducive to short-term employment skills training; or
- Training for these occupations which exhibited a limited demand may be accommodated through cooperative programs.

These issues were not addressed in depth as a part of this research effort; however, their policy and planning implications should not be overlooked in reviewing the findings.

Self-contained descriptions of the occupations explored during the course of this project follow. Where demand was estimated by sub-state regions it is summarized in the body of the text, with a more technical description of the estimation procedures provided in Appendix B. When *Illinois Manpower Projections* are referenced, they refer to projections produced by the Governor's Office of Manpower and Human Development for years 1980-1985. Regions represent the analytic regions defined by that Office.

The sub-state demand estimates provided for each of the new and emerging occupations are not intended to represent the *exact* number of workers that will be needed. They reflect a synthesis of information obtained from a variety of sources, and are intended to provide state and local vocational education planners with an approximation of the local demand for workers that will be needed in each of those occupations during the next five years.

BIOMEDICAL EQUIPMENT TECHNICIAN

The functions of the Biomedical Equipment Technician (BMET) historically have been served by such professions as the electronics technician, medical equipment repairers or the electronic medical technician for as long as hospitals have utilized electronic equipment. It is only within the last five to seven years, though, with increased sophistication of instrumentation and stringent Joint Commission on Accreditation of Hospitals safety compliance regulations, that the BMET has emerged as a distinct and urgently needed occupation.

Job Duties

The duties performed by BMETs vary dependent upon the employment setting in which they operate — hospitals and nursing homes, manufacturing, or sales and distribution. Duties within these different settings are outlined below:

1. Hospitals and Nursing Homes

BMETs employed by hospitals generally function in preventive and corrective maintenance capacities. Duties involved in the former include pre-purchase and post-purchase evaluation of equipment; testing for safe, proper and precise performance of equipment using sophisticated measurement instrumentation; and checking the adequacy of power throughout the hospital. Corrective maintenance duties involve calibration, trouble-shooting and repair of biomedical equipment. Additionally, the BMET position requires communication and interaction with medical personnel within the hospital and vendor service personnel, via service calls or training workshops on new or modified equipment.

These duties do vary somewhat, dependent on the size of the hospital or nursing home. Larger hospitals may employ a team of BMETs, allowing for increased specialization within the hospital (e.g., in surgical, intensive care and coronary care units) or by technical area (e.g., electro-mechanics, hydraulics and pneumatics). In these settings a BMET may function administratively in such activities as team leader, documenting services, and scheduling demonstrations and equipment tests. A smaller institution, on the other hand, may require only one BMET to be responsible for all electro-medical equipment in the hospital. In this case, the position would result in more diversity in problems encountered and more frequent interactions with service personnel.

2. Manufacturing

In a manufacturing setting, BMETs are likely to encounter more difficult problems, since the simpler ones are solved by hospital staff. In addition to equipment repair, duties performed by BMETs in manufacturing may include sales, sales support (service), conducting training seminars, and interaction with laymen. The BMETs may also provide input into service preparation.

3. Sales and Distribution

BMETs who are employed by equipment distributors primarily function in a sales/service capacity, with duties not as varied as the hospital technicians since they deal with specialized products. Dependent upon the degree of specialization of the equipment and the number of pieces of equipment in operation in the field, the BMET position in a distributor setting may involve considerable travel for servicing.

Educational or Training Requirements

A two-year associate degree in Biomedical Equipment Technology or a similar degree in Electronics Technology with six months' training in Biomedical Equipment Technology is generally required to become a functioning BMET. BMETs may also receive training on the job through manufacturers' workshops and through extension or continuing education programs to update their knowledge in what is a constantly changing field. Formal education programs are offered by the military, community colleges and four-year institutions. A curriculum should include course work in the basic sciences, human anatomy and physiology, medical terminology, industrial and digital electronics, and computer hardware and software.

After completion of a two-year degree in BMET and two years' experience, or a two-year degree in Electronics and three years' experience, or four years' experience, BMETs are eligible to sit for a certification exam. (These requirements are presently being investigated by the Association for the Advancement of Medical Instrumentation and may be revised.)

Illinois presently has one program for training BMETs, a three-year curriculum at Southern Illinois University at Carbondale requiring an electronics background for entry. However, a program of training is suitable to a community college setting, provided the institution has laboratory facilities used for other allied health courses and/or cooperative relations with medical schools or hospitals for clinical practicums. During the past year, both Oakton and Thornton Community Colleges have been researching the employment demand and developing the curriculum for a BMET program. Pending state approval, these additional training programs may be operable in the near future.

Typical Employers

BMETs are typically employed by hospitals and nursing homes, equipment manufacturers and distributors. Additionally, the U.S. Food and Drug Administration and insurance companies may offer potential employment opportunities for BMETs to deal with the medical/legal/insurance aspects of biomedical equipment.

Sex Barriers

Presently there are no or few women in the BMET field in the Illinois area, though this is attributed to personal vocational interests of trainees rather than any real sex barrier.

Wages and Hours

BMETs are primarily employed full-time, receiving an average of $12,000 annually with some variation due to type of employer and location.

Present Sources of Workers

Due to the lack of sufficient formal training programs, employers are presently having difficulties in filling BMET positions with qualified individuals. As mentioned earlier, some training is offered by manufacturers; thus, BMETs entering the field via this route may have backgrounds in diverse specialty fields.

Summary of Employment Demand

With the recent proliferation of biomedical equipment and instrumentation there is presently a desperate need for Biomedical Equipment Technicians. Hospitals are unable to keep up with repair and calibration and frequently find themselves waiting for service. A recent survey of hospitals in the Chicago area, conducted by Oakton Community College, supports this contention. Based on the results of that survey, it was concluded that two to three programs in BMET are needed to satisfy the needs of Northeast Cook County alone.

Regional demand for BMETs was further estimated using data on hospital size published by the American Hospital Association. Linkages were established between BMETs and hospital bed size to estimate the number of new positions in the field. BMETs were linked to electronic technicians to obtain an estimate of replacement rates from *Illinois Manpower Projections*. The five-year demand for BMETs was estimated at 286 state-wide, with a majority of the positions concentrated in the Chicago area (Region 2). Regional breakdowns are presented in Figure 1. These estimates, along with evidence provided by employers, indicate the need for training in Biomedical Equipment Technology.

Figure 1. 1978-1983 Regional Employment Requirements for Biomedical Equipment Technician (Statewide Total = 286)

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Agencies to Contact

The following individuals were very helpful in providing information regarding the BMET and can be contacted for further information:

Dr. Krishnan
Southern Illinois University
Carbondale, IL 62901
(618) 453-5129

Mr. John Raiger
Palos Community Hospital
Palos Park, IL
(312) 361-4500

Ms. Suzanne Jacobs
Oakton Community College
Morton Grove, IL
(312) 967-5120

Dr. Rallings
Southern Illinois University
Carbondale, IL 62901
(618) 536-2364

INDUSTRIAL HYGIENE TECHNOLOGIST

Industrial Hygiene Technologists provide assistance to professional industrial hygienists in the measurement and analysis of potential health hazards in work environments. Until recently, the job duties of the technologists were performed by professional industrial hygienists, safety professionals, chemists or professional support personnel who also performed other job duties. Within the last five years or so the job duties have been recognized as those of full-time industrial hygiene technologists. Certification of industrial hygiene technologists has been available sine 1976.

Job Duties

There are two major types of job duties which industrial hygiene technologists perform. The first of these involves the collection of samples (e.g., air, temperature, radiation, chemical, etc.) from work environments in order to monitor those environmental characteristics which might cause sickness, discomfort or impaired health or well-being among workers or citizens of the community. The other classification of job duties involves the laboratory analysis of samples obtained from work environments. Some technologists perform both types of duties, while others perform only one type.

The skills of a full-time industrial hygiene technologist are most likely to be needed by the larger industrial corporations. In smaller industrial companies, the job duties of an industrial hygiene technologist could include those usually performed by a safety technician. These might entail conducting first aid training for employees, maintaining records on individual employee injuries, and developing specifications for the purchase or installation of fire protection equipment. Even when employed full-time as an industrial hygiene technologist, there is considerable similarity to the duties performed by safety technicians. In a recent study conducted for the National Institute for Occupational Safety and Health, (Vernon, et al.)[1] the following activities were found to be performed by industrial hygiene technicians and safety technicians:

Maintain required OSHA records;
Conduct health and safety committee meetings;
Interview employees concerning hazards on the job;
Maintain records on individual employee exposures;
Collect air samples;
Analyze results of air quality monitoring;
Measure noise and vibration levels;
Determine workers' total noise exposure;
Monitor radiation levels; and
Conduct walk-through inspections to identify potential hazards.

Activities performed by industrial hygiene technologists which are not usually performed by safety technicians generally involve laboratory analysis of samples and the calibration of equipment (e.g., Palide meter, cyclone separator, gas chromatograph, etc.).

Educational or Training Requirements

At the present time there are no training programs in Illinois specifically designed to prepare people to become industrial hygiene technologists. Most IH technologists have some post-secondary training in science or engineering, and many receive on-the-job training from professional industrial hygienists.

An Associate Degree is considered the appropriate level of training for IH technologists. Course work should include occupational health and safety, mathematics, chemistry, communications, physical science and specialty courses pertaining to industrial hygiene (e.g., recognition, measurement and evaluation of physical exposures; toxic substances in industry; training workers in safety and health; etc.). (Vernon, et al.)

Certification of IH technologists is available through the American Board of Industrial Hygiene. Certification requirements include adequate performance on a written examination and:

(1) A high school diploma plus five years of work experience under the supervision of a professional industrial hygienist; or

(2) An Associate Degree plus three years of work experience under the supervision of a professional industrial hygienist.

Qualified IH technologists interested in career advancement can become professional industrial hygienists through further education and meeting professional certification requirements.

Typical Employers

Industrial hygiene technologists are most frequently employed by large manufacturing firms such as steel mills, automobile manufacturers, petrochemical companies and chemical manufacturers; large insurance companies generally do not have a need for a full-time industrial hygiene technologist, although they might employ someone with the combined skills of a safety technician and an IH technologist.

The Occupational Safety and Health Administration (OSHA) does not currently employ industrial hygiene technologists. The job position of IH technologist has not

[1] Ralph J. Vernon, et al., *A Suggested Curriculum for the Occupational Health and Safety Technician* (College Station, TX: Texas A & M University, draft).

been created by OSHA nor approved by the U.S. Civil Service Commission. Existing positions most similar to those of an IH technologist are filled by individuals with baccalaureate degrees. However, OSHA representatives indicated a definite need for IH technologists to assist the professional staff.

Sex Barriers

While probably more men that women are currently employed as industrial hygiene technologists, employment opportunities appear to be equally available to both sexes. The field of industrial hygiene, like many other occupational areas, has a predominance of males at all levels. However, a growing number of women are employed as professional industrial hygienists, and a similar trend can be expected for industrial hygiene technologists.

While not a barrier to entry into the occupation, it should be noted that in some settings IH technologists might be exposed to chemicals which present fetal-toxin problems.

Wages and Hours

IH technologists are primarily employed full-time. Entry level wages in Illinois were estimated to range from $7,500 to $14,000.

Present Sources of Workers

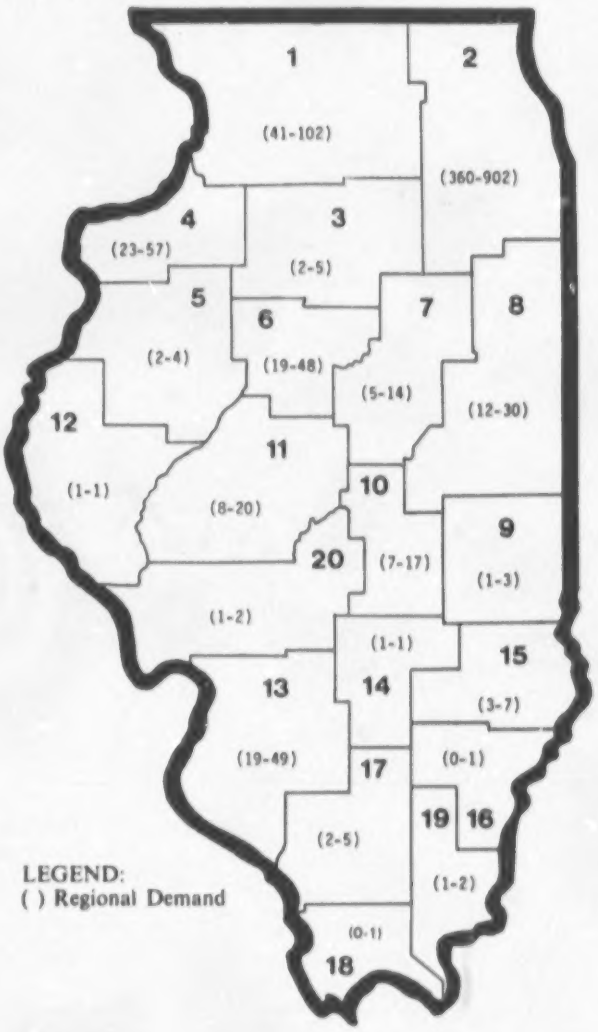
The lack of qualified industrial hygiene technologists has forced many employers to utilize the more highly skilled professional industrial hygienists to perform the duties of technologists. Some companies provide in-service training to safety technicians to supplement their skills with those of an IH technologist. In other instances, community college graduates or college students with training in science or engineering are hired and trained to perform the duties of a technologist.

Summary of Employment Demand

The field of industrial hygiene is growing rapidly both across the nation and within the State of Illinois. Professional industrial hygienists in Illinois increased by 16 percent from 1977 to 1978, and annual increases in the number of professional industrial hygienists were projected to be 12 percent over the next five years. The number of industrial hygiene technologists is expected to grow at a rate even faster that that of professional industrial hygienists. Whereas there are currently fewer technologists that professional industrial hygienists, within five years it is projected that there will be 2-5 technologists for each IH professional. The five-year demand for IH technologists in Illinois is estimated to range from 508 to 1,278. The demand is shown by region in Figure 2.

The increased demand for industrial hygiene technologists is due primarily to current and anticipated industrial standards and regulations established by the Occupational Safety and Health Administration (OSHA). Projections of the future demand for IH technologists are based upon the assumption that OSHA will continue to establish health standards which will require companies to routinely monitor the safety of their work environments. Those monitoring activities and the preparation of reports for submission to OSHA will create additional employment opportunities for industrial hygiene technologists.

Figure 2. 1978-1983 Regional Employment Requirements for Industrial Hygiene Technologist (Statewide Total = 508-1270)



Agencies to Contact

The following individuals were extremely helpful in assessing the needs for industrial hygiene technologists:

Mr. C. Lyle Cheever
Argonne National Laboratories
Building 14
Argonne, IL 60439
(312) 972-3311

Mr. Jerome T. Siedlecki
Standard Oil Company
200 East Randolph Drive
Chicago, IL 60601
(312) 856-6111

Mr. Henry J. Muranko
Olin Corporation
91 Shelton Avenue
New Haven, CT 06511
(203) 789-5439

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Mr. William E. McCormick
American Industrial Hygiene Association
475 Wolf Ledges Parkway
Akron, OH 44311
(216) 762-7294

PODIATRIC ASSISTANT

Podiatric Assistants have been employed as long as there have been podiatrists—approximately 60 years. However, it is only more recently, with increased demand for Podiatry, that they have become prevalent in group and private practice settings and that medical duties have emerged.

Job Duties

There are two types of podiatric assistants: 1) chair side assistant, who may also be called charge nurse and 2) business office assistant, frequently titled business manager. The chair side assistant assists the physician by performing such duties as taking and developing X-rays, constructing foot pads and devices, applying and removing casts, giving injections, drawing blood, sterilization, prepping patients for surgery, assisting in surgery, and physiotherapy. In general, the chair side assistant screens patients and performs lower-level medical tasks, thus allowing the physician to treat a greater number of patients. The business office assistant in the Podiatry practice, on the other hand, does not participate in the medical treatment of patients. This occupation is more akin to a medical secretary or general office worker and involves such duties as keeping accounts and medical records, answering the phone and greeting patients.

In some practice settings this division of labor may not be evident. Large group practices generate a patient load capable of supporting the duties of both types of assistants. In a practice with a single podiatrist, an assistant may be required to perform both office and medical activities. However, with increasing delegation of tasks to medical support personnel, the single practitioner may also support more than one assistant. The optimal situation would be that each assistant is trained in office and medical duties, enabling him or her to perform in both capacities. This would not only allow for greater flexibility in an office situation, but also offer the assistants greater job opportunities and mobility.

Educational or Training Requirements

At present there is no formal training program in the State of Illinois for the Podiatric Assistant; assistants are generally high school graduates or graduates of programs in general medical assisting who receive on-the-job training. A program of training for Podiatric Assistant could be offered at either the high school or community college level and would involve both classroom studies and a cooperative component in a practice setting. A curriculum should include general education, business office education and general medical assisting courses. This core should be supplemented with coursework specific to podiatry. The course of work could be completed in two years or one year of intensive study. Assistants can be certified by the Midwest Podiatry Conference in Illinois. Requirements for certification are passing an examination and working for a podiatrist for 1-2 years.

Typical Employers

Podiatric assistants are presently employed by podiatrists in private or group practice and in clinics. Potential sources of employment are hospitals with a large volume of outpatient surgery (e.g., Northwest Surgical Center in Arlington Heights) or hospitals with a large number of podiatry cases (e.g., North Lake Community Hospital).

Sex Barriers

Though no tangible sex barrier exists, most of the podiatric assistants presently employed or seeking employment are female.

Wages and Hours

Wages vary, dependent on location and setting. A rough range is $550-$650 per month. It is primarily a full-time job.

Present Sources of Workers

A majority of podiatric assistants are high school graduates who are trained on the job. Occasionally positions

Figure 3. 1978-1983 Regional Employment Requirements for Podiatric Assistant (Statewide Total = 404)

are filled with trained workers (turnover from another practice or workers who received out of state training), but this is limited. Employers in Illinois all stated the need for a training program to provide a reliable source of workers.

Summary of Employment Demand

Projections of the demand for the podiatric assistants were estimated by linking the job with its closest established occupation, the podiatrist. Estimates of the number of chair side assistants per podiatrist converged on one. The number of office assistants per podiatrist varied a bit more, ranging from one to two. Thus, a conservative estimate of the total number of assistants required by one podiatrist is two.

The estimation procedure, which utilized *Illinois Manpower Projections* for podiatrists, yielded a total five-year demand of 404 podiatric assistants. The distribution of demand by region of the state is portrayed in Figure 3. This high rate of demand, coupled with employers' acceptance of a training program in podiatric assisting, indicate the need for such a program.

Agencies to Contact

The following were found to be excellent sources of information:

Mrs. Betty Richardson
Illinois College of Podiatric Medicine
Chicago, Il
(312) 664-3301

Dr. Lowell Weil
Resident, North Lake Community Hospital
Chicago, IL
(312) 372-0224
Office: 298-5252

THERAPEUTIC RECREATION TECHNICIAN

The necessity for rehabilitating thousands of World War II veterans stimulated the emergence of therapeutic recreation as a profession in the 1940s. By the early 1970s, the scope and responsibilities of the profession had grown to such an extent that holders of baccalaureate and graduate degrees were involved primarily with administration and research. The need for trained sub-professionals to work directly with clients became critical.

Job Duties

The Therapeutic Recreation Technician (TRT) teaches physically, mentally or socially handicapped clients leisure skills to facilitate the rehabilitation process. The technicians use leadership, group observation and instructional skills in a variety of activities. Depending upon the resources available and the clients' needs and interests, the activities may include athletics, dancing, arts and crafts, music, movies, parties, gardening, camping, patient councils and patient newspapers. The TRT may also participate in program planning, analysis and budgeting.

Educational or Training Requirements

Two curricula have been developed to train TRTs. The National Therapeutic Recreation Society, a branch of the National Recreation and Park Association, has developed a 750 hour course to train the TRT I (a title and level recognized by the Society). The course contains the following 11 modules:

Modules	*Course Content*
I	Orientation to Therapeutic Recreation Services
II	Agencies, Institutions and Teamwork involved in Delivery of Therapeutic Recreation Services to Special Populations
III	Introduction to Human Growth and Development Throughout the Life Cycle
IV	Basic Information on Disabling Conditions
V	Communication Techniques
VI	Dynamics of Group Leadership
VII	Recreational Activity Skills
VIII	Introduction to Activity Analysis
IX	Program Planning and Development
X	Administrative Practices
XI	Practicum

Educational institutions and community agencies may apply to NTRS for approval to offer the program. The level of the instruction denotes the need for mature post-secondary adults and adult students.

The Bureau of Education for the Handicapped, U.S. Office of Education, supported the development of a two-year curriculum presently being offered by three Illinois community colleges: Moraine Valley Community College, Triton College and Parkland College. The curriculum, entitled *Therapeutic Recreation Education: Developing a Competency-Based Entry-Level Curriculum*, is available for $9.00 from the Book Center of the National Therapeutic Recreation Society.

Typical Employers

Employers of TRTs include agencies and facilities which serve the developmentally disabled, learning disabled, aged, socially/economically deprived, physically disabled and correctional populations. Other employers are special recreation cooperatives and park districts.

Sex Barriers

No sex barriers exist for employment as a TRT.

Wages and Hours

The starting salaries of TRTs range from minimum wage (currently about $5,500) to $9,500 per annum. Typically, however, a TRT can expect to earn from $8,000 to $8,500 the first year and to work full-time.

Present Sources of Workers

Those workers employed in therapeutic recreation at the technician level may have completed a formal training program in a therapeutic recreation program, or a program in related areas such as mental health or occupational therapy. Others have qualified for their position through a combination of relevant education and experience.

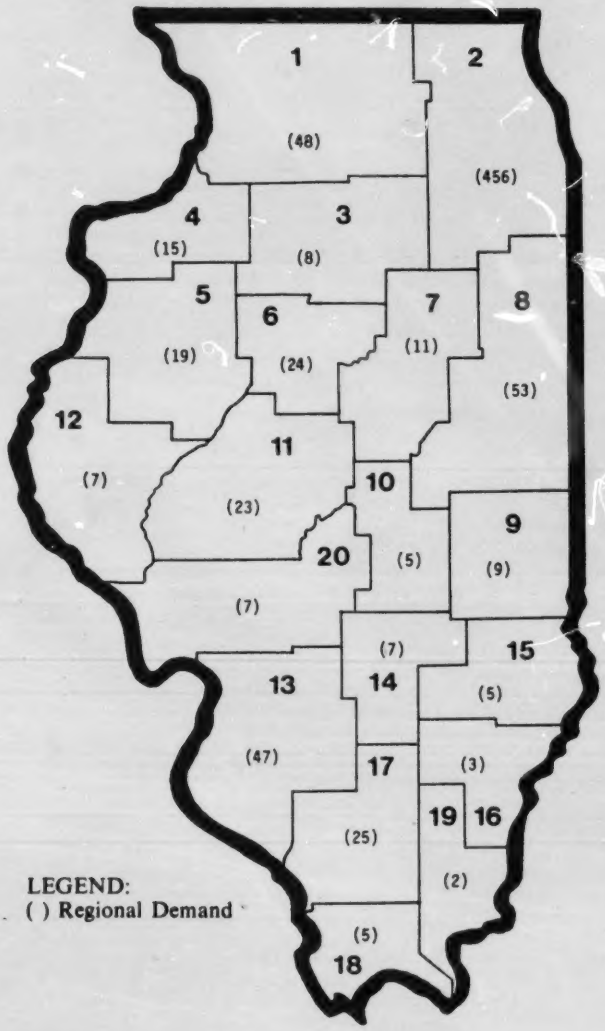
Summary of Projected Demand

The job opportunities of TRTs in Illinois are numerous in that an estimated 778 openings will occur between 1978 and

1983. This estimate is based on the findings of a comprehensive study of TRT employment and training needs in Illinois conducted by the University of Illinois in 1975-76. The results of that study are considered still to be valid and to be the best projection of future demand for TRTs. The regional distribution of the openings is shown in Figure 4.

The three TRT curricula in Illinois have graduated about 35 students a year for the past several years. Given that some graduates enter four-year programs and that others choose alternative careers, clearly the three existing training programs in Illinois will not meet the State's future needs for TRTs. Other community colleges should consider the possibility of offering training in this area.

Figure 4. 1978-1983 Regional Employment Requirements for Therapeutic Recreation Technician (Statewide Total = 778)



Agencies to Contact

The following individuals were very helpful in providing information regarding the Therapeutic Recreation Technician and can be contacted for further information:

Dr. Carol Peterson or
Dr. Scott Gunn
Department of Recreation and Park Resources
University of Illinois
Urbana, IL
(217) 333-0105

Mr. Lewis Brackett
Moraine Valley Community College
10900 South 88th Avenue
Palos Hills, IL 60465
(312) 974-4300

Ms. Penny Devin
Triton College
2000 Fifth Avenue
River Grove, IL 60554
(312) 456-0300

Mr. Tim Wolfe
Parkland College
2400 West Bradlay Street
Champaign, IL 61820
(217) 351-2200

Ms. Yvonne Washington
National Therapeutic Recreation Society
1601 North Kent Street
Arlington, VA 22209
(703) 525-0606

SWINE CONFINEMENT FACILITY ASSISTANT MANAGER

Swine production in Illinois is a major industry, ranking second only to Iowa. With increased land prices over the past 25 years, farmers have turned from range production to confinement facilities. This trend has become pronounced within the last decade. An estimated 25 percent of the hogs produced in Illinois are raised in total confinement facilities; a portion of the remaining stock are raised in partial confinement. Because many of the confinement facilities are large, owners often require the assistance of a Swine Confinement Facility Assistant Manager.

Job Duties

The swine confinement facility assistant manager has administrative responsibilities including purchasing of goods, maintaining production records and cash flow ledgers, and making profit/loss projections. The assistant manager also selects swine to be bred. After the piglets are born, the assistant manager coordinates the nursing, farrowing and finishing stations to ensure that the facilities are properly utilized and that hogs are raised efficiently. In the health area the assistant manager oversees castrations, needle teeth clipping and vaccinations. Because the swine are very sensitive to heat, an important duty is the operation of the heating, air conditioning and ventilation systems. After the hogs reach maturity, the assistant manager assists the owner in marketing. Auxiliary duties include maintenance of mechanical and electrical equipment.

Education and Training Requirements

A two-year community college curriculum is most suitable for training assistant managers. However, secondary level

vocational agriculture programs may provide enrollees with most of the needed skills and technical knowledge. Many of the Illinois community colleges already offer some courses in livestock production, but only a limited number have the breadth needed to comprehensively train assistant managers. A complete program should include economics, agricultural finance, management (planning, resource allocation, scheduling, personnel supervision, motivation and performance evaluation), instructional techniques, swine reproduction, genetics, nutrition, veterinary science, care of swine, marketing, agricultural engineering and mechanics. Electives might include grain production and electrical wiring.

A necessity for any sound program is the opportunity for students to gain practical experience in confinement facilities. A possible pattern of temporary assignment is structuring student placements for a minimum of three months and perhaps as long as six months. This time period would enable an owner to provide adequate instruction time and enable the student to acquire needed skills and technical knowledge.

Typical Employers

Graduates of swine confinement programs are employed by confinement facilities and by companies selling goods to the facilities. Other types of employment include working in grain elevator storage facilities as managers of the feed department and as swine buyers for meat packing firms.

Present Sources of Workers

The present assistant managers have been trained in either two or four-year animal science programs or have been given on-the-job training.

Sex Barriers

No sex barriers to employment exist, although most assistant managers are male.

Wages and Hours

An assistant manager can expect to earn a starting salary of $10,000-$15,000. An incentive for piglet production may be added to the base salary. After three or four years, earnings may be in the $15,000-$20,000 range and include fringe benefits such as a residence and pork.

An assistant manager's hours vary a great deal; they are never short. A 40-hour work week is minimal, and the hours of work may extend to twice that on occasion.

Summary of Employment Demand

In 1975, 25,127 farms reported marketing hogs in Illinois.[1] Of these farms, approximately 6,300 are confinement facilities of which 10 percent have an immediate need for assistant managers. The number of total confinement facilities is expected to grow about six percent over the next five years. These figures, when combined with a replacement rate of ten percent, yield an estimated 690 openings for assistant managers in Illinois by 1983.

The present schools with comprehensive swine confinement curricula are unable to satisfy the demand for assistant managers. One community college received approximately 25 requests from within a 50-mile radius of the school between January 1 and March 31, 1978, and was able to fill only three positions. This critical shortage of assistant managers by Illinois pork farmers represents an opportunity for the community colleges to further contribute to the fulfillment of the State's manpower requirements.

The regional distribution of employment demand is presented in Figure 5.

Figure 5. 1978-1983 Regional Employment Requirements for Swine Confinement Facility Assistant Manager (Statewide Total = 690)

[1]Illinois Cooperative Crop Reporting Service, *Illinois Agricultural Statistics: Assessors' Annual Farm Census* (Springfield, IL: Illinois and U.S. Departments of Agriculture, 1976).

Agencies to Contact

The following were found to be excellent sources of information:

Mr. Bud Aupperle
Black Hawk College
Post Office Box 489
Kewanee, IL 61443
(309) 853-3381

Mr. Sid Hutchcraft
Illinois Park Producers Association
531 East Washington
Springfield, IL
(217) 523-0514

Mr. R.P. Kessler
Agricultural Extension Service
University of Illinois
Urbana, IL
(217) 333-0752

SOLAR ENERGY TECHNICIAN

It has become increasingly apparent that continued reliance upon petroleum and natural gas as sources of energy is politically and economically unwise. Nuclear and coal power likewise have problems of their own. Recognition of those facts has led the federal government to emphasize energy conservation and the development of new technologies to provide alternative sources of energy to fossil fuels. Currently, thousands of residential and commercial solar heating and cooling demonstration projects are being funded as a result of P.L. 93-409, the Solar Heating and Cooling Demonstration Act. The production of medium termperature solar collectors has increased 15-fold since 1974.[1] The use of solar energy systems in homes and buildings for space heating and cooling and water heating has given rise to the occupation of solar energy technician.

Job Duties

The duties of a solar energy technician can be grouped into three areas: (1) design; (2) installation; and (3) maintenance and repair. In the design phase a technician advises a client on the optimal solar system, taking into consideration the client's needs, the cost of the system, the size and location of the structure, and system performance characteristics. The technician then writes and draws detailed specifications of the system design. In the installation phase the technician supervises or assists in the construction and installation of the system. The technician may follow a set of specifications or, especially in the case of smaller structures such as single-family dwellings, select a system that will fulfill a large proportion of a building's heating and/or cooling needs. In either instance the system is installed so that it integrates with the more conventional systems; e.g., water and electric heat. The technician tunes the system to operate at peak efficiency, and afterwards, maintains and repairs the system.

Presently, few people in Illinois are engaged in solar energy system work on a full-time basis. When not involved in solar activities, they perform more conventional tasks in heating/ventilation/air conditioning, plumbing, pipe fitting, or sheet metal work. It is uncertain whether we are witnessing the gradual emergence of an occupation; i.e., solar energy technician, or merely the broadening of job duties within existing occupations. Either case has implications for vocational education in Illinois.

Educational or Training Requirements

The Illinois State Board of Education, foreseeing that increased use of solar energy would have curricular implications for vocational education, funded a study by National Evaluation Systems (NES) to examine this issue.[2] The researchers found that a number of controversies existed between interested professionals on the level, type and recipients of training necessary for solar heating and cooling system design, installation, maintenance and repair. They concluded that "the training should be directed at producing more widely skilled workers who have more specialized solar-related knowledge in addition to competencies required for more conventional occupations."

The lack of agreement among professionals regarding the appropriate level, type, and recipients of training noted by NES still exists. However, vocational education planners cannot wait until there is a consensus (assuming there ever will be) before taking action. Clearly the need for competent workers in the solar energy field is present and growing. The recommendation by NES that solar technology training be incorporated into existing curriculums for more conventional occupations remains sound. The training should provide recipients with the competencies required to design a system; qualitatively evaluate standard (mass-produced) solar systems; select the appropriate system for a structure; and install, maintain and repair the system. The competencies should be presented in modular form so that students could choose module(s) congruent with their career goals. Modular presentation also would be most advantageous to workers already in the field who wanted to upgrade to their knowledge and skills. For example, an architect probably would be interested only in the design and selection module(s).

As noted by NES, present training curriculums vary in level, type, length and format. To assist educators and others, the U.S. Department of Energy is hosting the National Energy Education, Business, and Labor Conference in January 1979. The conference's objective is to plan national, technical and citizen energy education strategies needed to achieve the objectives of the National Energy Plan. Preceding the conference a task force will review documents which recommend competencies of trained energy manpower, level of skill required, model curriculum design and equipment needed for training. Their report will be presented at the conference and used by DOE for program planning. The report should be a useful resource for vocational education planners.

Typical Employers

Presently, most firms engaged in solar energy work are also involved in other areas, such as plumbing, heating/ven-

[1]U.S. Department of Energy, Energy Information Administration, *Annual Report to Congress*, Volume III, 1977), p. 20.

[2]S. A. Rubenstein and J. G. Ramsay, *The Advent of Solar Energy: Implications for Vocational Education in Illinois* (Amherst, MO: National Evaluation Systems, Inc., 1977), p. 60. (Sponsored by the Illinois State Board of Education).

tilation/air conditioning or sheet metal. A few firms specializing in solar energy systems have emerged in the past two or three years.

Sex Barriers

While most solar energy technicians are male, this pattern is typical within the construction industry and is not indicative of hiring practices based upon an applicant's sex. It was generally believed that work in the solar energy field was open to both males and females.

Wages and Hours

The wages of solar energy technicians correspond to the wage rates in the skilled trades and range from $8.00 to $15.00 per hour. Most are employed full-time but, as noted earlier, perform solar work only a portion of this time.

Present Sources of Workers

The two primary sources of workers are apprenticeship programs in HVAC, plumbing, pipe fitting, sheet metal or carpentry and on-the-job training.

Summary of Projected Demand

The need for workers possessing the knowledge and skills to design/select, install, maintain and repair solar energy heating and cooling systems is clear. In 1974 there were four solar energy equipment distributors in Illinois. Today there are over 90. The U.S. Department of Energy (DOE) projects that by 1985 2.5 million homes in the United States will have solar systems, by 1990 7.0 million.[1] Assuming that (1) the DOE projection of 2.5 million solar homes in the United States by 1985 (President Carter's goal also) will be accurate and (2) Illinois' participation will be in proportion to its share of the national housing inventory, an estimated 431 openings for solar energy technicians will occur in Illinois by 1983. Based on the distribution of plumbers and pipefitters in Illinois, the demand was calculated by sub-state region. These estimates are portrayed in Figure 6.

However, a number of future events could impact on these projections. For example, the DOE projections assume (1) continuation of the current research, development and demonstration program by the Department of Energy and (2) a $200 million Government Buildings Program to introduce solar equipment into Federal facilities. Other factors which could increase the adoption rate of solar energy technology are: (1) implementation of the loan guarantee and financial incentives authorized by P.L. 94-385, (2) Congressional passage of the tax credits requested in the President's Energy Program, (3) implementation of accelerated depreciation allowances for capital equipment purchased and low interest loans, (4) greater than $200 million appropriated for the Government buildings program, (5) State legislative approval of regulations regarding standards for solar energy equipment, (6) increased acceptance by local zoning commissions of structures with solar energy systems and (7) increased willingness by banks to lend money for new homes and buildings with solar equipment, and for retro-fitting of existing structures.

Agencies to Contact

The following individuals can be contacted for further information:

Mr. David Z. Pogany
Division of Energy
Illinois Department of Business and Economic Development
Springfield, IL
(217) 782-1926

Mr. Richard Royen
Century Solar Engineering
Bensonville, IL
(312) 860-2555

Figure 6. 1978-1983 Regional Employment Requirements for Solar Energy Technician (Statewide Total = 431)

[1]U.S. Department of Energy, Energy Information Administration, *Annual Report to Congress*, Volume II, 1977, p. 233.

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HALFWAY HOUSE RESIDENT MANAGER

A halfway house is a community-based residence offering an alternative to highly structured institutions for clients needing supervision, habilitation or rehabilitation. Types of clients served in halfway houses include alcoholics, drug abusers, the developmentally disabled and the mentally ill. For a client a halfway house may represent an alternative to placement in an institution or a way to gradually return to the community from an institution.

Halfway houses have been in existence since the 1950s. However, within the past ten years they have assumed increased importance as the trend toward deinstitutionalization in the delivery of human services has emerged, and thus have risen in number. With this rise has emerged the occupation Halfway House Resident Manager.

Job Duties

The halfway house resident manager (HHRM) is part of a team which provides critically needed services to clients. Constituting the team are professionals; e.g., psychologists, social workers, vocational rehabilitation counselors, speech therapists, direct care staff (e.g., activity aides and mental health technicians) and support staff, e.g., custodians, cooks. The HHRM has responsibilities in two areas: administration and program. In the administrative area the manager is responsible for the overall operation of the halfway house. Fulfillment of this responsibility requires the manager to supervise support staff; expend funds in accordance with pre-set policies, procedures and budget; maintain good relations with neighbors and the community; set and maintain house rules; keep records; and write reports. In the programmatic area the HHRM helps clients reach their highest level of independent living. The manager supervises and may work with direct care staff who provide services to residents. Responding to crises—for example, a client wanting to leave the program prematurely—is a very important responsibility. The manager coordinates activities internally and with external organizations and events such as schools, employers, movies or ballgames. The manager also informs the professionals of the clients' progress.

Educational or Training Requirements

Presently there are no HHRM programs per se in Illinois. Community colleges do have the resources considered appropriate for training HHRMs, however. An option in HHRM could be created through the merger of programs in Human Services and Business Administration. The subjects to be included would be management principles, public administration, organizational theory, goal setting, problem-solving skills, supervision, sociology, psychology, and individual and group counseling. The training should include an internship in an appropriate institution. The length of the program would vary from six months to two years depending on a student's prior education and work experiences. The level of the instruction offered in the preparatory institutions and the urgent need for mature managers of halfway houses make it imperative that the instruction take place largely in post-secondary institutions.

Community colleges offering both business administration and human service programs have the basic courses needed to prepare students as HHRMs. The primary effort for those schools will involve administratively creating the option and informing students who are interested in human service careers of the job opportunities for HHRMs.

Typical Employers

Typical employers are private, non-profit community agencies which provide residential and training-treatment services to alcoholics, drug abusers, the developmentally disabled and the mentally ill. The agency may provide other services such as day care or foster care in addition to halfway house services.

Sex Barriers

An applicant's sex has no effect on employment opportunities except perhaps in situations where the clients are either all male or all female.

Wages and Hours

Starting salaries range from $6,000 to $10,000 annually and, in some cases, a form of room and board. The position offers full-time employment, sometimes requiring more than 40 hours per week. Because of the U.S. Department of Labor regulations requiring overtime pay for work over 40 hours per week, some facilities are managed on a shift basis. While a manager retains overall responsibility for the halfway house, on the manager's off-duty shifts the facility is managed by senior program staff members.

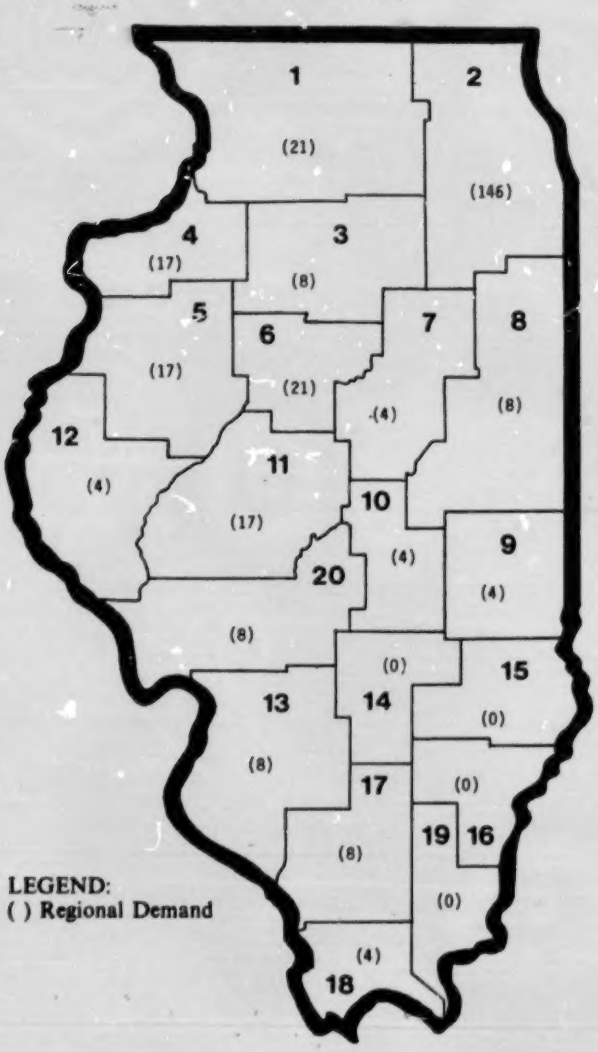
Present Source of Workers

Present HHRMs have attained their positions through either post-secondary education and experience, or experience alone. Those entering the occupation through a combination of education and experience have typically attended or graduated from four-year post-secondary programs, usually in the social sciences. They may gain experience in institutions while students, either as volunteers or employees, or may work for an institution after leaving school. Others have qualified for the position through employment experience in institutions. Types of institutions offering relevant experience include day care centers, community living facilities, group homes, psychiatric hospitals, mental health centers, and alcohol and drug abuse centers. Applicable experience includes working as a mental health technician, activity aide, house parent or workshop supervisor in these institutions.

Summary of Employment Demand

Currently Illinois has approximately 100-125 halfway houses. The estimated growth rate is ten halfway houses per year over the next several years. Additional openings will be created through job turnover. Because of the long hours and the pressures created by having to cope with crises on a regular basis, the average tenure is from one-and-a-half to two years. Given the growth rate and the high turnover, there will be an estimated 300 openings for HHRM over the next five years in Illinois. The regional demand estimates are presented in Figure 7.

Figure 7. 1978-1983 Regional Employment Requirements for Halfway House Resident Manager (Statewide Total = 300)



Agencies to Contact

The following individuals are excellent sources for further information:

Dr. Ron Rembish
DeKalb County Villages
DeKalb, IL
(815) 756-9705

Mr. G. Benhartog
Illinois Alcoholism and Drug Dependence Association
Springfield, IL
(217) 787-0588

Mr. Gayland Good
Department of Mental Health and Developmental Disabilities
Springfield, IL
(217) 782-7393

Occupations Which Possibly Qualify as New and Emerging

Cardiopulmonary Technician/Technologist
Diagnostic Medical Sonographer
Expanded Function Dental Auxiliary
Home Health Aide
Multi-Competency Technician
Ophthalmic Medical Assistant
Physician's Assistant
Tumor Registrar
Automotive Electronics Technician
Energy Efficiency Technician
Housing Rehabilitation Specialist
Laser/Electro-Optics Technician

Areas for Further Follow-up

EEG Technician/Technologist
Optometric Assistant/Technician
Biological Photographer
Paralegal Aide

CARDIOPULMONARY TECHNICIAN/TECHNOLOGIST

Rapid advances in technology and methodology in the cardiopulmonary field have spawned the need for technical specialists in the area. The occupation of Cardiopulmonary Technician or Technologist has arisen out of this need.

Job Duties

The cardiopulmonary technologist, under the direction of a physician, performs procedures related to heart and lung functions. In larger institutions the technologist may specialize in the heart (cardiovascular) or lung (pulmonary) area. Some of the duties involved in the cardiovascular sub-specialty are assisting in diagnostic and therapeutic procedures such as cardiac catheterization, pacemaker evaluation, echocardiography, vector cardiography and exercise stress testing; recording and analyzing data generated during the procedures; and analyzing specimens. Functions of the pulmonary sub-specialty include procedures such as determining lung volumes and compliance, pulmonary stress testing, blood gas analysis and physiologic gas analysis. Additionally, both specialties may entail cardiopulmonary resuscitation; recording medical histories; and developing, monitoring and maintaining instrumentation. The actual duties performed by the technologists are dependent not only on the area of specialty but also on the employment setting and the physician in charge.

Educational or Training Requirements

The National Society for Cardiopulmonary Technology states four principal entry levels in cardiopulmonary technology (CPT):

- College background with on-the-job training;
- Associate Degree in CPT received through a community college program;
- Bachelors Degree in CPT received through a college or university; or
- High school diploma with extensive on-the-job training.

As there are no programs for training cardiopulmonary technologists in the State of Illinois at this time, individuals working in the area are generally trained on the job and come from a variety of educational backgrounds. However, training in CPT appears to be appropriate for the community college setting since most of the instruction is highly technical. Efforts to develop a curriculum were initiated in Illinois; but due to inertia, funding difficulties or other unknown obstacles, a program was never implemented.

Outlook

The variety of potential functions which the cardiopulmonary technologists fill poses problems in (a) defining the career, (b) identifying the training requirements and (c) estimating the demand for trained technologists. Opinions secured in Illinois of the need for training programs in CPT differed. Some individuals in the field felt that because of the specialized equipment in various institutions, on-the-job training would be required regardless of previous formal training. Others were of the opinion that an associate degree program would provide adequate training in CPT. All did agree, however, that the field is capable of experiencing substantial growth. Thus a further investigation by the State of Illinois of the demand for cardiopulmonary technologists and the feasibility of providing training through the Illinois community college system appears to be warranted.

DIAGNOSTIC MEDICAL SONOGRAPHER

The occupation of Diagnostic Medical Sonographer has emerged with the development of ultrasound techniques in medicine and the resultant demand for technical specialists in the area. Though clinical ultrasound has been in use since 1961, it is only in the last eight to ten years that the field has experienced its major growth and even more recently that it has become organized.

Job Duties

The diagnostic medical sonographer utilizes ultrasound procedures to image organs, masses and fluid accumulations within the body for use in diagnosis. The sonographers operate in a variety of specialty areas, such as neurology, cardiology, gastroenterology and obstetrics/gynecology; the techniques utilized may differ dependent on the specialty. Duties include preparing and interacting with patients; performing ultrasound scans; recording or reviewing patient history, observations and clinical and sonographic data; presenting data to a physician; and clerical activities. Though sonographers work under the direct supervision of a physician, the position requires discretion and judgment in the performance of services.

Educational or Training Requirements

The tenth draft of the "Essentials of an Accredited Educational Program for the Diagnostic Sonographer" was recently completed by the American Medical Association in cooperation with various specialty organizations. This document, if approved, will require a minimum of three years' post-secondary education for program accreditation. The training may be offered as a three-year integrated program in an educational institution or a one-year program in ultrasound with a prerequisite of two years of education or experience in a technical allied health profession. There is also provision for a two-year community college program in ultrasound where students are required to concentrate on one of the specialty areas.

A training program in diagnostic medical sonography includes both clinical and didactic phases. Components of a comprehensive curriculum should include physics, instrumentation, applied biological sciences, patient care, clinical medicine, applications and limitations of ultrasound, and related diagnostic procedures. Completion of a training program or five years' experience in ultrasound qualifies the sonographer to sit for the registry examination given by the American Registry of Diagnostic Medical Sonographers. Upon successful completion of the exam, sonographers are certified as Registered Diagnostic Medical Sonographers (RDMS).

There are no complete training programs in diagnostic medical sonography in the State of Illinois at this time. Triton College does offer a 12-week introductory evening course. Also, Saint Anne's Hospital in Chicago graduated two students last year, but has temporarily discontinued the program pending approval of the AMA educational essentials. Thus, a majority of the sonographers in Illinois are individuals with some medical education; e.g., radiologic technology, practical nursing or Bachelor of Science, who are trained on the job in ultrasound techniques.

Figure 8. 1978-1983 Regional Employment Requirements for Diagnostic Medical Sonographer (Statewide Total = 60-95)

Outlook

The field of diagnostic medical sonography is expected to grow at a rate much faster than the average of all occupations. Suburban hospitals are starting ultrasound departments to compete with other facilities, while urban facilities and medical centers are adding new and more sophisticated equipment. There is currently a scarcity of trained sonographers in many areas of the State.

Utilizing data from the American Hospital Association and the *Illinois Manpower Projections*, the five-year demand for diagnostic medical sonographers was projected. The estimates ranged from 60-95 with a large proportion of the demand concentrated in the Chicago region (See Figure 8). Though the demand was not sufficient to meet the criterion of 20 openings per year, it is an area which seemingly has great potential and should be monitored closely.

EXPANDED FUNCTION DENTAL AUXILIARY

The Expanded Function Dental Auxiliary (EFDA) is an occupation which is emerging in response to the need for dental care in institutional and rural settings.

Job Duties

The EFDA is an extension of the dental hygienist and dental assistant occupations. Supplemental training allows this new dental auxiliary to assume added responsibility, thus enabling dentists to significantly increase their productivity. Examples of duties which could be assumed by a qualified EFDA are taking impressions, placing and carving restorations, providing preventive education and care, maintaining care, and troubleshooting after an initial dental visit. The utility of the EFDA is most evident in institutional settings with no dental care units; e.g., prisons, mental institutions, and nursing homes. Similarly, rural areas and ambulatory care provide potential employment opportunities for the EFDA.

Outlook

At present the Expanded Function Dental Assistant is a concept with limited implementation. Roles which dental auxiliaries may assume are governed by State Dental Practice Acts and are relatively restricted at this time in the State of Illinois. However, 36 states have modified their Practice Acts to enable auxiliaries to practice in various modes, and there are movements in many States to further expand the

standards for institutional service. Additionally, the Committee on Dental Health Research is submitting a paper to induce research and develop the concept. At present no one can be sure of the functions, training or licensure that will accompany the position; however, it is a potential area for future community college involvement in Illinois.

HOME HEALTH AIDE

The occupation of Home Health Aide has grown with the acceptance of home health care as a cost-effective alternative to institutionalized care.

Job Duties

Home health aides provide personal care to ill or handicapped persons in their homes. The aide is a member of a health services-provision team which offers care based on a plan of service developed by a physician. Examples of tasks carried out by the home health aide are assisting in daily living activities; e.g., personal hygiene, household duties, planning and preparing meals, and ambulation; providing basic medical services such as checking pulse and respiration and assisting with medication; helping patients to cope, physically and psychologically, with problems associated with their illnesses; and recording and reporting patient progress. Activities of the aides are continually supervised by a registered nurse.

Educational or Training Requirements

The Illinois State Board of Education, Department of Adult, Vocational and Technical Education has approved a program for training of the home health aide. According to Health Consultants at DAVTE, the curriculum is currently being implemented at the secondary level in Illinois. However, the State of Illinois Public Health Department is presently promulgating regulations for home health aides in relation to licensure mechanisms for Home Health Agencies. Recommendations will include proposals that (a) the Public Health Department develop guidelines for curricula, (b) a moratorium be placed on the use of home health aides until the guidelines are complete (October 1, 1979) and (c) a proficiency assessment be implemented to determine qualified incumbents. It is expected that after October 1, 1979, all home health aides will have to complete an approved training program offered by vocational education centers, community colleges or health facilities. These developments will impact on vocational education programs in terms of revising existing curricula in accordance with Public Health Department Guidelines.

Outlook

With expected increased federal support, third-party payment and public acceptance of home health care, the numbers of home health aides will continue to grow in response to the demand. It is recommended that vocational education programs administer to the demand through program expansion and with curricula reflective of State and Federal regulations.

MULTI-COMPETENCY TECHNICIAN

A unique approach to the problem of providing health care to rural populations is through the employment of the Multi-Competency Technician. Rather than a new occupation per se, the multi-competency technician presents the merging of several existing health occupations. However, because of the novelty of the concept, a cursory investigation of the occupation was deemed appropriate.

Job Duties

The multi-competency technician functions in two of three technical specialty areas: medical laboratory, respiratory therapy and x-ray. By being trained in more than one area of expertise, the multi-competency technician is better able to meet the unique needs of the smaller or rural hospital—providing a basic level of care at a cost within the budget of the institution. In the infrequent cases when more sophisticated care is warranted, the patients may be transferred to a specialized facility in an urban center.

Educational or Training Requirements

Southern Illinois University received a four-year grant from the Bureau of Health Manpower to develop an educational model for the multi-competency technician, to implement the model and to evaluate its effectiveness. An outreach method of training was adopted, whereby students were trained in hospitals that demonstrated some evidence of need. Courses were delivered via slides, audio tapes and textbooks. Thus, students had the responsibility of learning on their own with day-to-day supervision of a hospital supervisor and biweekly visits from SIU staff. The students received approximately one year of training in each of the two subject areas chosen.

Outlook

At this point the project appears to have been successful. (The Final Report will be available in August or September, 1978.) As of May the director expected better than 90 percent placement of the students involved in the programs. Students demonstrated high levels of competency and were able to meet hospital needs. Given some evidence for future demand for the multi-competency technician, the program is feasible in a community college that demonstrates a commitment to deliver education through the outreach method. As the curriculum for the MCT has already been developed, start-up costs would be at a minimum. A source of involvement for DAVTE is through the development of an articulation program which would involve well-equipped high schools in the initial phases of the vocational preparatory program for MCTs. The director of the experimental program was supportive of articulation in high schools where students can receive credits for their work upon entry at SIU.

The multi-competency technician is a concept which is too new to reflect what possible future employment demands might develop. However, it is an approach which may have much to offer in terms of cost-effective rural health care, and an area in which the Illinois Community College Board and DAVTE may wish future participation.

OPHTHALMIC MEDICAL ASSISTANTS

Three levels of allied personnel in ophthalmology are emerging as a result of increased delegation of responsibilities to support personnel in health. Two of these, the Ophthalmic Assistant and the Ophthalmic Technician, fall

within the educational boundaries defined by this study. The third, the Ophthalmic Technologist, requires a four-year degree for certification.

Job Duties

Ophthalmic Assistant: The ophthalmic assistant performs a number of routine technical procedures under the direct supervision of an ophthalmologist. Functions of the assistant include obtaining general and ocular medical histories; performing ocular measurements such as visual acuity, accommodation, muscle balance, field of vision and interpupillary distance; interacting with patients through instruction, administration of medications and the changing of dressings; and performing basic instrument maintenance and adjustment tasks.

Ophthalmic Technician: The ophthalmic technician also works under the direct supervision of an ophthalmologist, providing services similar to those of the assistant in addition to more advanced technical procedures. Activities performed at the technician level include practical microbiology, ocular mobility measurements, ophthalmic and fundus photography, internal adjustments and calibration of instruments, and clinical and surgical assisting.

Educational or Training Requirements

Ophthalmic Assistant: One year of training is necessary to become eligible for certification as an ophthalmic assistant. This may be attained through a formal program offered in a secondary school, community college or technical institute; or a short-term or home-study course plus one year of work experience.

Ophthalmic Technician: The ophthalmic technician is an occupation with higher technical skills that those of the assistant. This level may be achieved through (a) on-the-job experience: three years is required to take the certification exam or (b) completion of a formal two-year training program in an institution such as community college.

Outlook

It is difficult to ascertain the statewide demand for ophthalmic assistants and technicians. Optimally, at least one assistant or technician could be employed by each ophthalmologist. However, not all ophthalmologists are receptive to these types of support personnel. The Chicago Board of Education in conjunction with Oakton Community College surveyed Chicago ophthalmologists and those in the surrounding area and received generally favorable responses. Based on the results of the survey, a two-year high school program in ophthalmic assisting is being initiated with an ophthalmic technician program at Oakton Community College expected to follow in two to three years. Though the estimated demand was sufficient to prompt the program development, it was suggested that further efforts in the Chicago area be contingent upon the successful placement of students trained in the pilot programs.

Estimates of state-wide demand were obtained by linking the assistants/technicians to ophthalmologists and projecting need based on the five-year growth rate of physicians. The results of the computations are presented by region in Figure 9. The demand, though sufficient to meet new and emerging criteria, is located primarily in Region 2. Thus, ongoing efforts in the Chicago area may be capable of satisfying a large portion of the state-wide need. However, as it is an emerging occupational area, growth may occur more rapidly than that projected using growth rates of physicians. Ophthalmic technology is a field which Illinois educators may wish to monitor; given evidence of future needs for ophthalmic assistants and/or technicians, local developmental efforts could be patterned after those already initiated in the Chicago area.

Figure 9. 1978-1983 Regional Employment Requirements for Ophthalmic Assistant/Technician (Statewide Total = 144)

PHYSICIAN'S ASSISTANT

The Physician's Assistant is an occupation which has emerged in response to the shortage and/or geographic maldistribution of physicians. Physician's assistants (PAs) serve as extenders to qualified physicians by performing

those tasks which do not require the specific skills and knowledges of a physician. This not only allows a medical team to serve more patients but also frees the physician to deal with more complex medical problems. The physician/PA concept thus has the potential of improving both the quality and quantity of medical care; however, Illinois licensing and training requirements are currently being reviewed and thus the occupational outlook in the State for PAs could not be determined.

Job Duties

Physicians' assistants work under the direct supervision of a licensed physician in the performance of medical duties. The actual functions which the PA may assume are dependent on State law, but generally include taking patient histories; performing physical examinations; assisting in diagnostic, therapeutic and follow-up procedures; treating patients in emergency situations; and patient teaching and counseling. Duties also vary dependent on the employment setting and medical specialty of the PA or supervising physician. For example, the Surgeon's Assistant is responsible for pre- and post-operative care procedures and assisting in surgery. The American Medical Association has approved four such specialties in physician assisting: Assistant to the Primary Care Physician, Orthopaedic Physician's Assistant, Surgeon's Assistant and Urologic Physician's Assistant.

Educational or Training Requirements

Educational programs for physicians' assistants vary significantly in length, content and entrance requirements. The most common approach is a 24-month program which involves one year of academic and preclinical instruction and one year of structured clinical learning experiences. A second type of program, the MEDEX model, relies on previous health care training or experience. This latter approach generally caters to individuals with a background as a military medical corpsman, an LPN or RN or in other medical specialties involving a significant amount of patient contact. Clinical coursework in PA programs generally includes anatomy, physiology, pharmacology and medical terminology. Specializations may involve such courses as general surgery, sterile techniques and surgical patient care (surgeon's assistant); emergency room technique; orientation to physical therapy, and prosthetics and orthotics (orthopaedic physician's assistant); or laboratory procedures and renal functions (urologic physician's assistant).

Physicians' assistants may become certified by the National Commission on Physician's Assistant Certification. The certification procedure assesses candidates' knowledges and abilities through a full day of written examinations and a partial day of observation and evaluation of applied clinical skills.

At present there are no formal programs for training the PA in Illinois. The development of curricula has been slowed somewhat by State mechanisms controlling the use of PAs. However, in mid-September, rules and regulations developed by the Illinois Department of Registration and Education will go out for review. The regulations will provide for 1) training for PAs to be conducted in AMA approved schools only and 2) licensure contingent upon national certification as a PA. At least one community college in the state is presently initiating curriculum development activities, and Loop College in Chicago expects to implement a two-year program in physician assisting in the 1979-1980 school year.

Outlook

The physician's assistant concept has been successfully applied in many areas of the country. With increased emphasis on the comprehensive provision of primary health care; e.g., through Health Maintenance Organizations, the utility of and demand for the PA is expected to increase. Physician assisting is an area which provides great potential for future community college involvement in the State of Illinois.

TUMOR REGISTRAR

The occupation of Tumor Registrar has emerged with the growth of epidemiological methods in the study of cancer and other chronic illnesses. Tumor registries, which collect and report cancer data, have been in limited use for 35-50 years; but only more recently have they expanded in number and functions.

Job Duties

Tumor Registrars perform a broad range of duties in the accession and follow-up of cancer cases. The degree to which an individual tumor registrar specializes within the field, in record abstracting or patient follow-up for example, is dependent on the size of the registry. In a large institution, the registrar may only be involved in one facet of the registry, where in a small hospital he may be responsible for the entire operation. The spectrum of possible duties is outlined briefly below:

- *Case Finding:* Identification of all cancer patients diagnosed or treated by the hospital.
- *Abstracting:* Review of all relevant sources of data and extraction and categorization of information such as how the diagnosis was made, treatment, spread, staging and etiology.
- *Follow-up:* Contact of physicians, nurses or organizations such as nursing homes, coroners' offices or hospitals for information on recurrence, treatment, survival course and demise.
- *Data Processing, Analysis and Reporting:* Integration and analysis of data in order that it can be used to identify incidence and survival patterns and improve the quality of medical care for cancer patients.
- *Administrative Activities:* Management, personnel, costing, requisitioning and other duties related to organizing a tumor registry.

Educational or Training Requirements

At present, the only formal training available in Illinois for tumor registrars is a two-week course offered by the American Cancer Society in Chicago. A no-cost home-study program, being developed by the National Cancer Institute, is an alternative source of training. Five of ten self-instructional volumes are currently available. It is the consensus of experts in the field that the appropriate training should be a one- to two-year course of study, preferably offered in a community college setting. To this end, a movement is underway within the National Tumor Registrars Association (NTRA) for tumor registrar to become recognized as a separate occupation, to provide certification mechanisms and to move the training into the community

college systems. The NTRA has recently completed educational standards for the tumor registrar and developed a set of curriculum modules.

However, questions as to the occupation's independence do exist. Efforts to receive Federal grant funds to establish a tumor registrar training program in California were thwarted by the DHEW Division of Associated Health Professions. In its concern for fragmentation and duplication of allied health profession training programs, the Division concluded that tumor registrar was a specialty area within the established field of medical records. Comparison of the proposed tumor registrar curriculum with that of medical records technician revealed considerable overlap in course requirements.

It is thus felt that the most suitable and cost-effective means of implementing a training program for tumor registrars is through supplementing a medical records curriculum with courses applicable to that specialty. Courses relevant to the tumor registrar could include the cancer subject field; e.g., staging, disease management, course, treatment, etiology, and differentiation of carcinomas; and epidemiological and bio-statistical methods. An approach such as this would not only avoid extensive curriculum development activities on the part of the educational system but also provide the graduates with a broader substantive background, allowing for greater job flexibility and mobility.

Figure 10. 1978-1983 Regional Employment Requirements for Tumor Registrar
(Statewide Total = 61-92)

Outlook

Present projections of the five-year demand for tumor registrars do not indicate the immediate need for a formal training program in that specialty. The five-year demand for health record technologists/technicians represents 61 percent of the current number employed.[1] Assuming a similar rate of growth and replacement for tumor registrars and estimates of 100-150 currently employed yields a five-year demand of 61-92. The results are presented by region in Figure 10. As there were no indications that tumor registrars will grow at a rate faster than health record technologists, these estimates seem reasonable and do not meet the statewide demand criterion of greater than 20 openings per year.

However, at least two potential events may impact on the future demand for tumor registrars. First, since a tumor registry is a prerequisite for approval of an institution by the American College of Surgeons and many Federal grant monies are contingent on that approval, additional registries may be initiated as indirect means of procuring funds. Secondly, cancer may become a reportable disease in Illinois. This would also impact on the number of tumor registrars in the State and consequently the number of tumor registries. Thus, the conclusion that training programs are not needed is based on present conditions. This situation is subject to change, perhaps in the near future.

AUTOMOTIVE ELECTRONICS TECHNICIAN

A technological trend in the automotive industry is the use of electronic systems to increase fuel economy and control emissions. While electronic components are presently only installed in a few select models; e.g., Cadillac Seville, by 1985 most cars will be equipped with the systems. This trend will in turn create the need for an Automotive Electronics Technician to diagnose and repair malfunctions.

Job Duties

The Automotive Elecronics Technician inspects a car with the aid of diagnostic equipment to determine whether an automotive problem is caused by electronic malfunction. If the problem is of an electronic origin the technician replaces faulty sub-components (usually "throw-away" parts) within the system. The technician may also be responsible for calibrating and repairing electronic diagnostic equipment.

Educational or Training Requirements

Because of the imminent demand for electronically skilled service personnel, schools should begin planning to meet this need. Secondary schools, community colleges and technical institutes could easily adapt existing automotive mechanics curriculums to meet the skill requirements of automotive electronics technicians by:

(1) offering one or two independent courses in electronics; or

[1] *Illinois Manpower Projections*, op. cit.

(2) integrating electronics within electrical theory courses (as one Detroit community college is planning to do).

Additionally, preparing trainees with the needed automotive electronics skills will undoubtedly be approached through apprenticeship programs and by adult and extension supplementary education programs offered in the school systems and major automotive manufacturing corporations.

Outlook

The ultimate impact of electronics on employment in the automobile service industry is uncertain. For example, whether most service centers will have a specialist for electronic problems or will use general mechanics to handle the problem, in addition to their other responsibilities, is unknown. The frequency of electronic system breakdowns and the time required to diagnose and correct the problem is not apparent. Industry sources were more certain of the following points: (1) all complete service centers soon will require someone with the knowledge and skills to diagnose electronic problems and replace sub-components within an electronic system, (2) the diagnostician will require general mechanical knowledge to be able to distinguish between non-electronic and electronic problems and (3) this new educational need for automobile service personnel should be integrated within existing training or apprenticeship programs.

ENERGY EFFICIENCY TECHNICIAN

Energy Efficiency Technicians assess heating, ventilation, air conditioning and lighting systems to ensure efficient energy consumption. They provide technical support to builders, contractors and graduate engineers in energy conservation planning for new buildings, registering requirements for existing structures and monitoring energy usage in building complexes.

Educational or Training Requirements

The substance of what an energy technician should acquire is primarily that which is included in the physics courses offered in connection with most technology curriculums. For example, physics (mechanics), physics (heat) and physics (electronics and light) can provide almost all of the needed technical background for the energy efficiency technician.

Outlook

The present demand for energy efficiency technicians appears to be quite low. Industrial sources indicated that they have begun giving increasing attention to energy conservation by appointing staff engineers to act as energy conservation coordinators in addition to their other responsibilities. While an energy efficiency technician would be an ideal sort of aid to the coordinator, presently a technician is not cost effective, and thus is not being utilized.

Two chief factors will affect the future employment of energy efficiency technicians: (1) the price of energy and (2) a federal energy policy. If the price of energy increases dramatically or federal policy mandates increased energy conservation, the demand for energy efficiency technicians will rise.

HOUSING REHABILITATION SPECIALIST

Increasing attention and resources are being committed to rehabilitation of dwelling units in America's inner-cities for several reasons: (1) new construction costs have increased dramatically in the last decade, (2) suburbia has reached its feasible commuting limit in many cities, (3) inner-city lending institutions are becoming aware of their vested interest in preserving their neighborhood housing stock and (4) federal funds are available for housing rehabilitation. A key actor in the rehabilitation process is the Housing Rehabilitation Specialist.

Job Duties

The housing rehabilitation specialist coordinates the rehabilitation of houses. The specialists may be involved in either or both of two major functions: financing and construction. In the financial area the specialist is the homeowner's liaison with financial institutions. The specialist performs credit checks, verifies employment and assists the owner in completing applications for loans. A general responsibility is maintaining an awareness of funds available for rehabilitation. In the construction area the rehabilitation specialist inspects houses to determine whether the structure is worth renovation, and if so, the type and extent of work required. In order to judge whether a house justifies rehabilitation, the specialist must appraise its before-rehab value and estimate its post-rehab worth. The specialist writes job specifications and obtains bids from the contractors of the work. After reviewing the bids and assisting homeowners in the selection of contractors, the specialist supervises or monitors the work in progress. When the work is completed, the specialist inspects it to ensure conformance with specifications and authorizes payment to contractors.

Educational or Training Requirements

In the financial area the specialist requires training in financing methods, regulations and laws. The specialist should be acquainted with sources of funds and eligibility requirements. Education programs for the construction area should include training in appraisal, architecture, general house construction, heating and cooling systems (including older types,) electrical wiring, plumbing and construction management. Additionally, the specialist requires knowledge of the structure and supporting systems (e.g., wiring, plumbing, etc.) to determine what components of a house need rehabilitation, to define solutions and to estimate the rehabilitation costs. The specialist must also have some background in laws and regulations in the building industry such as would apply to contracts, building codes and zoning.

Existing programs provide a ready supply of workers with basic training in financial matters. However, no secondary or post-secondary programs in Illinois focus on the construction aspects of rehabilitation. The only formal training in this area is a 12-week course conducted by the Urban Reinvestment Task Force located in Chicago. This program serves to supplement the skills of individuals currently involved in Neighborhood Housing Service projects in cities across the country. Community colleges are the appropriate level at which to offer a program for housing construction rehabilitation. The time required to complete the program would vary from six months to two years depending on the students' prior experiences and knowledge. The training should include case examples and provide hands on ex-

perience for the student. The most attractive alternative is to offer the needed instruction as an option within the architectural technology curriculum of the community college system.

Outlook

There is a great need for housing rehabilitation in Illinois. A 1970 survey revealed that 13.3 percent of Chicago's 182,399 households were physically inadequate.[1] The city employs approximately 15 rehabilitation construction aides (the entry-level position) and 25 specialists; an additional 20 to 25 specialists are employed in the private sector. In 1977, 57 cities and counties received $9,484,000 in rehabilitation funds under Title I of the Housing and Community Development Act of 1974. While these figures indicate substantial rehabilitation activity, in general those efforts are pursued independently and are not widely publicized. Consequently, the state-wide demand for rehabilitation specialists is uncertain. However, experts in the area supported the idea of a program to train rehabilitation specialists, especially in the construction area. There was a general consensus that finding qualified specialists is difficult and that curricula in this area would aid rehabilitation efforts.

LASER/ELECTRO-OPTICS TECHNICIAN

Since its discovery in 1960, the laser has been found useful in a variety of applications and settings. It is now used in medicine, military and space systems, non-destructive testing and measurements, construction, machining and materials processing, distance and angle measurement, data processing, communication systems and energy research.

The development of new laser materials, techniques and applications generally is performed by scientists and engineers. Implementation of the developments can be carried out by properly trained laser/electro-optics technicians.

Job Duties

The Technical Education Research Center (TERC) of Waco, Texas, in developing a laser/electro-optics technology curriculum, identified approximately 1,000 tasks performed by technicians. Fifteen of the "most desirable" skills of an effective laser/electro-optics technician included:

1. Troubleshoots and repairs laser systems;
2. Performs tests and measurements using electronic devices;
3. Performs alignment procedures on optical systems, especially those which invove lasers and related optics;
4. Prepares and reads shop drawings and schematics;
5. Maintains a laboratory notebook, performs data reduction, and prepares reports;
6. Operates interferometers, spectrometers, monochromators and spectrophotometers;
7. Operates laser systems, including intra-cavity modulation and Q-switching devices;
8. Utilizes basic laser and electrical safety practices in the laboratory;
9. Performs optical inspections and cleaning of optical components;
10. Operates and calibrates photodetectors; photomultipliers, optical power meters and calorimeters;
11. Processes photographic film and plates;
12. Produces and reconstructs holograms;
13. Selects laser and optical components based on optical, electronic and mechanical properties using manufacturers' catalogues and other trade publications;
14. Troubleshoots and repairs electro-optic devices; and
15. Fabricates and assembles components for laser/electro-optic devices and systems.[2]

Outlook

The demand for laser/electro-optic technicians is uncertain. Several firms were identified that employed a total of four technicians. Several other firms had provided on-the-job training for their technical staff because they were unaware of a supply of LEOTs. These positive demand indicators were counterbalanced by (1) firms which, by nature of their work, could have employed technicians but did not and had no plans to do so and (2) a key respondent who stated that graduates of the present laser/electro-optics schools exceed the demand by a very large factor.

The curriculum and instructional materials developed by TERC are being used by approximately ten schools across the country including North Central Technical Institute in Wausau, Wisconin; Vincennes Technical Institute in Vincennes, Indiana; and Cincinnati Technical College Institute in Cincinnati, Ohio. Given the uncertain demand for LEOTs in Illinois, curriculum development is not appropriate at this time. However, by monitoring recruitment from out-of-state programs Illinois can gain some insight into the employment growth of the occupation. If the demand for LEOTs grows as some have predicted, Illinois community colleges can proceed with curriculum implementation with full confidence that they are satisfying an important training need.

AREAS FOR FURTHER FOLLOW-UP

Due to the branching nature of the data collection activities in this study, occupational areas were identified which were not followed-up completely. Two of these occupations, EEG Technologist and Optometric Assistant/Technician, were given low priority for further follow-up because of one or more existing training programs in Illinois. Information on a third occupation, Biological Photographer, was received subsequent to the completion of the survey. A fourth occupation, Paralegal Aide, is already under consideration by the community college system. Brief descriptions of the occupations, in addition to possible contacts for follow-up by Illinois personnel, are provided below.

EEG Technician/Technologist

EEG Technologists use electroencephalographic equipment to record the electrical activity of a patient's brain. The technologist applies electrodes to a patient's scalp, connects them to the electroencephalograph, operates the instrument, observes the patient and records behavior. Though the occupation has been in existence since the 1950s, it was only in

[1]David Birch, et al., *America's Housing Needs: 1970 to 1980* (Cambridge, MA: Joint Center for Urban Studies, Harvard/MIT, 1973).

[2]TERC, op. cit.

1973 that the EEG Technologist was recognized by the AMA. A one-year formal training program in EEG technology is offered at St. John's Hospital in Springfield, and programs in EEG/EKG Technology are provided by Sherman Hospital in Elgin and Mount Sinai Hospital Medical Center of Chicago. None of these programs is accredited by the AMA. Individuals who could provide further information are:

Janet Brotherhood, R. EEG T.
Executive Secretary-American Society of
EEG Technologists
2997 Moon Lake Drive
West Bloomfield, MI 48033

Lorraine Page, President
Illinois Society of EEG Technicians
500 North Mill Road, #8G
Addison, IL 60101

Joann Simser, R. EEG T., President
Central Society of EEG Technicians
2310 Beverly Road
St. Paul, MN 55104

Karen Parkos, R. EEG T.
St. John's Hospital
701 East Mason
Springfield, IL 62701

Optometric Assistant/Technician

Paraoptometric personnel (assistant and technician) assist the optometrist and provide patient education. Duties may include performing preliminary eye tests, measuring the power of the cornea, determining the power of lenses, taking facial and frame measurements and providing information to patients regarding frame selection and care of contacts. Training for the optometric assistant level generally involves one year of study; for the optometric technician, two years. Both programs are offered at Plano Child Development Center in Chicago, and a program for the optometric technician is offered at Triton College in River Grove. Contacts at these institutions are:

Barbara Oing, Program Director
or Mrs. McCann, Dean of Health Careers
Triton College
2000 Fifth Avenue
River Grove, IL 60171

Robert L. Johnson, O.D., Program Director
Plano Child Development Center
2830 South Indiana
Chicago, IL 60616

Additional information can be obtained from:

Joyce Urbek
American Optometric Association
7000 Chippewa Street
St. Louis, MO 63119

Biological Photographer

Biological Photographers utilize the photographic media to present medical or scientific information. They perform basic photography duties such as taking photographs, making slides and movies, and processing and printing film relative to medical settings. Examples of activities include photographing viruses through an electron microscope and filming surgical procedures during an operation. The Health Sciences Communications Association in Millbrae, California, was only aware of one course in biological photography in Illinois, offered at Southern Illinois University. Further information may be acquired from:

John Richardson
Southern Illinois University
Department of Cinema and Photography
Carbondale, IL 62901

Marvin Lurie, Executive Director
Association of Biological Photographers
6650 Northwest Highway
Chicago, IL 60631

Paralegal Aide

Paralegal Aides assist attorneys in legal research, investigation of facts and preparation of documents. After researching documents such as statutes, recorded judicial decisions and land records, the paralegal aide prepares briefs, pleadings, wills, contracts and other types of legal documents for use by a lawyer. Other duties include collecting information for case planning, filing pleadings with court clerks, preparing affidavits of documents and maintaining document files. A paralegal aide may specialize in litigation, probate, real estate, or corporate or tax law.

Paralegal aides are employed by a variety of organizations including law firms, title companies, banks, corporations, and state and federal agencies. Many organizations having an on-going need for legal services are potential employers of paralegal aides.

Early in our investigation of Paralegal Aides we contacted the Illinois Community College Board and learned that Harper Community College is working closely with the Illinois State Bar Association on employment and training needs for Aides in Illinois. Professional staff of the Board knew of no information we could collect that would assist their efforts. Therefore, we pursued this area no further. Persons desiring information on the status of paralegal aide education in Illinois are urged to contact Ms. Janet Stroud of the Illinois Community College Board.

Occupations Which Do Not Qualify As New and Emerging

Alcoholism Counselor

Anesthesiologist Assistant

Communication Aide

Emergency Medical Technician

Geriatric Aide

Horticultural Therapy Technician

Nephrology Personnel

- Dialysis Technicial
- Nephrology Assistant
- Paid Partner

Nuclear Medicine Technologist

Ophthalmic (Fundus) Photographer

Pediatric Assistant

Pharmacy Aide

Profusionist

School Health Aide

Veterinary Assistant/Technician

Forest Recreation Technician

Pest Management

- Pest Field Scout
- Crop Protection Consultant

Computer Tape Librarian

Media Equipment Technician

Para Accountant

Chemical Spill Control Technician

Chromatography Technician

Crystal Manufacturing Occupations

- Crystal Technicians
- Crystal Growers
- Crystal Polishers
- Crystal Fabricators
- Crystal Assemblers

Electromechanical Technician

Heat and Power Engineer

Nuclear Instrumentation Technician

Nuclear Material Processing Technician

Nuclear Qualified Welder

Nuclear Quality Assurance Inspector

Power Reactor Technician

Radiation Protection Technician

Child Advocate

Dietetic Technician

Physical Security Technician

Public Safety Communication Operator

Recoverable Materials Coordinator

Security Officer for Airports

Wastewater Treatment Plant Occupations

- Wastewater Treatment Plant Technician
- Wastewater Treatment Plant Operator

Alcoholism Counselor

Job Duties

Alcoholism counseling does not differ significantly from other types of counseling, but does require a unique knowledge base: alcohol and its problems. Alcoholism counselors generally function as part of an interdisciplinary team providing both individual and group counseling to patients, their families and employers. The counselor acts as a rehabilitation case manager and with limited case loads is able to form intense relationships with the alcoholic patients.

Exclusion Criterion: Not New

Alcoholism counselor is not a new occupation; rather, its functions are presently being acknowledged by third party payers of health care through certification and training mechanisms. The State Alcohol Division is collaborating with Southern Illinois Univerity in the development of a series of courses in alcoholism counseling to be delivered through the Illinois Community College System. A credentialing process, which arose in response to third party payment requirements, is expected to become functional in the next year and should provide the impetus necessary to implement the planned training programs.

Anesthesiologist Assistant

Job Duties

The functions of the Anesthesiologist Assistant are similar to those of a physician's assistant, except they are in the area of anesthesiology. The anesthesiologist assistant provides pre- and post-operative care to patients and assists the anesthesiologist during surgery.

Exclusion Criterion: Education Requirements

At present there are two programs in the United States offering training in anesthesiologist assisting. One is a Master's level program at Emory University in Atlanta and the second, located at Case-Western Reserve in Cleveland, grants a Bachelor's degree. Educational guidelines for the anesthesiologist assistant are currently being developed through the American Medical Association, and it is expected that the requirements will exceed the educational criterion utilized in this study.

Communication Aide

Job Duties

The Communication Aide provides support to speech

pathologists and/or audiologists. Duties vary dependent on the employer but generally involve assistance in therapy for mild speech problems under the direct supervision of a certified clinician. Specific activities may include speech discrimination, production and articulation; equipment operation and maintenance; and housekeeping and clerical duties.

Exclusion Criterion: Education Requirements

The American Speech and Hearing Association (ASHA) has developed "Guidelines on the Role, Training, and Supervision of the Communication Aide." These guidelines specify limited responsibilities for the position and training ". . . by the speech and hearing program in which they are to be employed or in collaboration with the organization with which they are to be employed." This training is task-oriented and extends from a few days to several weeks. Thus, at present the communication aide does not meet the educational criterion for a new and emerging occupation. However, ASHA is currently revising its guidelines for supportive personnel. It is unknown at this time if the new guidelines will provide for expanded duties or formal training for the communication aide, but it is expected that they will be in effect in another year.

Emergency Medical Technician

Job Duties

Emergency Medical Technicians (EMTs) respond to emergency calls and provide on-the-scene care to the critically ill or injured. After determining the nature of the casualty, the EMTs administer emergency care procedures; e.g., controlling hemorrhages, opening and maintaining an airway, providing cardio-pulmonary resuscitation, treating shock, bandaging, assisting in childbirth and administering drugs. Additional duties include transporting the patient to an emergency treatment facility, administering care en route as directed by a physician and maintaining the ambulance in efficient operating condition. Dependent on their training and work experience, EMTs may be rated ambulance, non-ambulance, dispatcher or paramedic.

Exclusion Criterion: Existing Curriculum

There is currently a network of EMT training programs in Illinois. The basic EMT training package is offered at 35 sites at ongoing times. There are 22 approved programs in advanced life support (Paramedic). An alternative means of delivering the EMT training is through the high schools. This is being explored in the New York area, and an article in the *Journal of Emergency Care and Transportation* (May/ June, 1978; p. 28) discusses the feasibility of this option. Though the alternative was not well received by a contact within the Illinois Emergency Medical Services, it is an area which DAVTE may wish to explore.

Geriatric Aide

Job Duties

Geriatric Aides function in capacities similar to nurse aides, though in dealing with a limited population they encounter specialized health problems. Responsibilities concentrate on problems specific to the aged; e.g., senility, physical and psychological difficulties associated with chronic or terminal illnesses, personal hygiene and activities of daily living. Specific duties are conducted under the supervision of an LPN or RN and may include bathing and dressing patients; serving and feeding meals to patients; aiding in ambulation; measuring and recording temperature; pulse, respiration, height and weight; and communicating observa-

Exclusion Criterion: Existing Curriculum

The Illinois State Board of Education, Department of Adult, Vocational and Technical Education has approved a program for training of the geriatric aide. According to a DAVTE Health Consultant the curriculum is currently being implemented at the secondary level in Illinois.

Horticultural Therapy Technician

Job Duties

Horticultural Therapy Technicians provide therapy, recreation, leisure, or vocational training to special populations such as mentally or emotionally disturbed, physically handicapped, elderly and prisoners. Horticultural techniques serve as non-threatening agents of a rehabilitative process which is tailored to a population's unique needs. The technicians participate in activities such as floral design, greenhouse or grounds maintenance, gardening and landscaping.

Exclusion Criterion: Insufficient Demand

The current demand for horticultural therapy technicians is apparently quite low as no institutions or organizations were located that hired them. When individuals do perform functions of the horticultural therapy technician, it generally occurs on a part-time basis as part of the duties of occupational or physical therapy technicians. In other words, the occupation is in an emerging state. Perhaps when the Bachelor's level program at Illinois State University gets underway, the horticultural therapy field will gain more exposure; and the demand for technician level personnel will evolve.

Nephrology Personnel

With the increasing utilization of dialysis in the treatment of end stage renal disease, a number of occupations are developing. However, since nephrology technology and resultant legislation are still in the process of emerging, the occupations and their training requirements are not fully developed as yet. Brief descriptions of the range of duties performed by nephrology personnel and the concommitant training issues follow.

Dialysis Technician

Job Duties.

The American Association of Nephrology Nurses and Technicians recognized "three distinct though often overlapping types [of Dialysis Technicians]:"

1. the technician assigned only to responsibilities of equipment maintenance and dialysis support services;
2. the technician who participates in a variety of patient care activities with or without responsibilities as in number one above;
3. the technical/technologist who may have advanced education and extensive responsibility for nearly all aspects of a dialysis program.[1]

[1]The American Association of Nephrology Nurses and Technicians, *The Role of the Dialysis Technician.* (Position paper developed by the AANNT, 1976).

Exclusion Criterion: Education Requirements.

With the exception of a renal program offered by Malcolm X in Chicago, training for technicians (1 and 2 above) is provided on the job. This appears to be the most suitable means of training the technicians for a number of reasons. First, different dialysis units require different duties of the technicians. It is doubtful that a program could account for the variety of potential activities. Secondly, dialysis units operate under limited budgets as a result of cost-containment measures by the Federal Government (Social Security Act). Increased training for dialysis technicians would result in increased costs, a situation inconsistent with governmental efforts to contain Federal expenditures for dialysis. Third, it is counter-productive to offer costly training for an occupation with limited upward mobility and thus a source of frequent turnover. Finally, research efforts may increase the sophistication of dialysis, and with resultant simplification of treatment methods, less involvement from skilled personnel will be required.

Authorities generally felt that some type of uniform training and continuing education is desirable for dialysis technicians. However, it appears that the American Association of Nephrology Nurses and Technicians has assumed the prime responsibility for upgrading the role of the dialysis technician and the quality of patient care.

Nephrology Assistant

Job Duties.

Nephrology Assistants assist physicians specializing in the treatment of kidney diseases and disorders. The nephrology assistant is responsible for assisting dialysis patients and maintaining the kidney machine. Other duties may include administering medication or blood transfusions, assisting in surgery, and patient contact.

Exclusion Criterion: Insufficient Demand.

Employment opportunities in Illinois for nephrology assistants are limited. They are primarily employed by university medical centers, often for assistance on research projects. With the competition from nurses specializing in dialysis, it was not felt that there is presently a great demand for nephrology assistants.

Paid Partner

Job Duties.

A "Paid Partner" is an individual trained to assist patients who dialyze at home. The paid partner has duties similar to those of the dialysis technician and additionally must be able to handle emergencies on his own.

Exclusion Criterion: Education Requirements.

The thrust of pending Federal legislation (H.R. bill #8423) is to contain Federal expenditures on dialysis. One aspect of these cost-containment measures is to encourage home dialysis through reimbursement for supplies, equipment, personnel and administrative costs. When the provisions of this bill become active (in perhaps two to three years), the demand for the paid partner will increase substantially. Results of current research on the use of paid partners (e.g., a project being conducted at the Research Triangle Institute, Research Triangle Park, North Carolina; Fred Bryan, Project Director) will also impact on the utilization of paid partners.

The paid partner is an occupation which is expected to experience considerable growth in number over the next five years. However, at this time the optimal training situation is not known. Dialysis units are well-qualified to provide training. In this setting the patient and partner can be trained together, building a bond of trust between the two. Also, the partners are being adequately trained in a period of 8-12 weeks,[1] thus not meeting one of the present criteria for new and emerging occupations.

Nuclear Medicine Technologist

Job Duties

Nuclear Medicine Technologists perform diagnostic tests and therapeutic treatment utilizing medical procedures which have evolved from advances in nuclear science, radiology, pathology and internal medicine. Specific duties include preparation of radioactive dosages, intravenous or oral administration of radiopharmaceuticals, nuclear scanning, collection and analysis of biological samples, data preparation, and interaction with patients and physicians. Because of the nature of the science, the technologists are responsible for radiation safety and quality control.

Exclusion Criterion: Existing Curriculum

There are a number of programs in Nuclear Medicine Technology within the State of Illinois at this time, with a total capability of graduating approximately 54 technologists per year. It was the general consensus of individuals in the field that existing training programs were sufficient to satisfy the demand for Nuclear Medicine Technologists. This is supported by hospital manpower vacancy data collected by the Illinois Hospital Association.[2] The study reported nine full-time and two part-time budgeted vacancies for Nuclear Medicine Technologists in 65.7 percent of Illinois' short-term general hospitals. Given similar conditions in non-reporting hospitals, the total number of budgeted vacancies during the reporting period (October-December, 1977) was about 15 full-time equivalent positions.

Ophthalmic (Fundus) Photographer

Job Duties

Ophthalmic Photographers take photographs of the eye to aid an ophthalmologist in detecting and diagnosing degenerative or hereditary diseases of the eye or conditions such as diabetes and hypertension. The photographer may specialize in retina (fundus) or corona photography or perform both types. Related duties may include dark room activities, slide copying, preparation of audio-visual materials, surgical photography, flourescein angio-graphy, clerical activities and patient relations.

Exclusion Criterion: Insufficient Demand

At present there are only approximately 10 ophthalmic photographers in the Chicago area. Though the occupation has grown in the past ten years, the demand for the services of the ophthalmic photographer is limited. Further restricting the demand is a trend for physicians to do their own pho-

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[1] R. Evans, Research Triangle Institute, personal correspondence.

[2] Health Occupations Placement System, *IHA Regional Employee Vacancy Study* (Oak Brook IL: Illinois Hospital Association, February, 1978).

tography and send out for processing. Because of the lack of demand, a formal education program for the fundus or ophthalmic photographer is not appropriate at this time.

Pediatric Assistant

Job Duties

A Pediatric Assistant is a medical assistant specializing in child care. Pediatric assistants perform clinical duties; e.g., sterilizing equipment, collecting specimens, performing lab tests, taking body measurements, and performing tests and screening procedures; patient contact duties, such as receiving patients, preparing patients and their parents for examinations and scheduling appointments; and clerical duties.

Exclusion Criterion: Insufficient Demand

The duties of the pediatric assistant do not differ substantially from those of a general medical assistant. In fact, many pediatric assistants are simply medical assistants who are employed by a pediatrician. Thus, it does not seem rational to provide costly training for an apparently unneeded specialty. This contention is supported by recent action by the American Association of Medical Assistants (AAMA). The AAMA has suspended the certification for the Pediatric specialty in Medical Assisting due to lack of participation. (In three years only about 100 individuals were certified nationwide.)

Pharmacy Aide

Job Duties

Pharmacy Aides provide assistance to pharmacists primarily in a hospital setting. Duties may include typing, filing, ordering supplies, stocking, labelling pharmaceuticals, communicating with other departments of the hospital, mixing and dispensing pharmaceutical preparations under supervision, and cleaning supplies, equipment and glassware. Because of the nature of the occupation, pharmacy aides are required to pay strict attention to detail and adhere to stringent quality control mechanisms.

Exclusion Criterion: Existing Curriculum

The Illinois State Board of Education, Department of Adult, Vocational and Technical Education has approved a program for training of the pharmacy aide. According to a DAVTE Health Consultant the curriculum is currently being implemented at the secondary level in Illinois.

Profusionist

Job duties

The profusionist operates a heart-lung machine (pump oxygenator) during open heart surgery, and as such, has complete control of the patient's functions. Auxiliary duties may include research activities; e.g., anti-coagulation studies, blood tests, operation of long-term cardiac support equipment and respiratory therapy.

Exclusion Criterion: Education Requirements

Due to the complexity of profusion technology and its interrelationship with a variety of other branches of medicine, some medical or science education or background is generally a prerequisite for admission to a training program. Essentials for an education program in profusion technology are presently being developed through the American Medical Association. Most likely, the essentials will state a B.S. degree as an educational requirement.

The anticipated future demand for profusionists is also questionable. There is current debate as to the value of the coronary bypass which represents 80 percent of all open heart surgery. If funds for coronary bypass surgery are cut back, there will be a resultant decline in the demand for profusionists. Thus, at present the profusionist does not appear to meet the criteria for a new and emerging occupation. However, it is recommended that Illinois keep abreast of pending AMA and governmental action with respect to profusion technology and re-evaluate the occupation in terms of this action.

School Health Aide

Job Duties

School Health Aides assist school nurses in some of the more routine aspects of providing health care to students. Examples of duties of the aides are clerical activities, audio-visual screening and administering first aid and non-prescription medication under supervision.

Exclusion Criterion: Education Requirements

The position of school health aide requires little specialized education—limited first aid training and four to five days' instruction in screening and record keeping—all of which can be provided with minimal effort and cost on the job.

Veterinary Assistant/Technician

Job duties

Veterinary Assistants and Technicians perform a wide range of duties to assist the veterinarian. Some examples of these duties are animal nursing; laboratory testing; radiographic procedures; assisting in surgery, anesthesiology, hospital sanitation and kennel cleaning; and reception/clerical duties. Some specialization within these areas may occur in larger practices.

Exclusion Criterion: Insufficient Demand

There is a two-year, associate degree program in Veterinary Technology offered by Parkland College in Champaign, Illinois. Additionally, a large percentage of Veterinarians train their assistants on the job to meed the individual needs of their practices. At present, the Parkland program is considered sufficient to satisfy the state-wide demand for technicians. A state-wide survey of veterinarians was recently conducted by the Illinois State Veterinary Medical Association. The results of the survey, as yet not available, may provide additional information concerning veterinarians' needs for support personnel.

Forest Recreation Technician

Job duties

Forest Recreation Technicians are forest or park technicians who specialize in recreation management. The technicians function in both planning and service capacities to the end of improving the aesthetics, facilities and ultimately the use of park areas. Specific duties may include facility planning, maintenance, vegetation and wildlife management, accident prevention, fire control, and soil and water conservation activities. Additionally, the position may require a significant amount of interaction with the public to explain programs and procedures and provide general assistance.

Exclusion Criterion: Existing Curriculum

The duties of the forest recreation technician were not found to differ significantly from those of a park technician. As this occupation has been in existence for quite some time there are numerous training programs in Illinois which provide the skills necessary to become a forest recreation technician.

Pest Management

Job Duties

Pest management involves a Pest Field Scout inspecting a farmer's fields for insects, weeds, plant pathology and nematodes and recording the observations. A Crop Protection Consultant reviews the report and designs a program to control the pests using chemical and non-chemical methods.

Exclusion Criterion: Education Requirements

A two-day training course is conducted for pest field scouts at the University of Illinois each spring. This instruction is supplemented by a limited amount of field training by agricultural extension agents. Because scouts are employed only during the summer, typically the scouts are teachers and students on vacation.

The crop protection consultants usually have either undergraduate or graduate degrees in agriculture or entomology, or many years of agricultural experience. Currently, there are approximately 10 consultants in Illinois. The estimated total number of scouts employed by the consultants range from 40-100 each summer.

Computer Tape Librarian

Job Duties

Computer tape librarians are employed by large insurance companies, government agencies, data processing firms and large companies with extensive holdings on tape. Their job duties include indexing, cataloging, filing and cleaning magnetic data tapes. In some settings they might also package and ship data tapes to clients or other officers of the company.

Exclusion Criterion: Education Requirements

Computer tape librarians generally do not have any specialized training prior to their employment. Most receive from one day to three months of on-the-job training, depending upon the scope and complexity of the duties they will perform. A high school diploma, an interest in data processing and a willingness to work are the entry level requirements. Preference is given to individuals who have had some exposure to data tapes or data processing.

Media Equipment Technician

Job Duties

A Media Equipment Technician distributes and maintains audio and video equipment used in education. The Illinois State personnel system has two occupational classifications which relate to media equipment technicians: Audio-Visual Technician I and II.

Exclusion Criterion: Not New

Media equipment technicians have been employed in school settings at least since the early 1960's.

Para Accountant

Job Duties

A Para Accountant assists a certified accountant in both tax and audit functions. The paraprofessional in accounting performs such duties as entering data on computer input forms, bookkeeping activities, preliminary preparing of tax or audit schedules, filing, trial book balancing, and doing footings and extensions.

Exclusion Criterion: Existing Curriculum

The duties performed by a para accountant closely resemble those of an accounting clerk or an individual with a two-year degree in accounting. Programs of preparation in these areas are widespread in Illinois.

Chemical Spill Control Technician

Job Duties

An earlier study of new and emerging occupations indicated that Chemical Spill Control Technicians perform various types of field work to remove chemical spills on land or in water. That study rejected the occupation as new and emerging on the basis of existing curricula.[1]

Exclusion Criterion: Insufficient Demand

There are three to four companies in Illinois that are engaged in spill control work. Contacts with these organizations indicated that none of them employed individuals whose jobs resembled the Meleen description. Furthermore, the total number of people employed in occupations related to spill control is quite low, and the work is oftentimes performed by individuals on a part-time basis.

Chromatography Technician

Job Duties

Chromatography is the separation of mixtures into their constituents through preferential absorption by a solid. A Chromatography Technician operates equipment and follows procedures to separate, identify and quantify compounds for analytical purposes. Often the technician carries the title of Laboratory Technician and performs other types of chemical analysis in addition to chromatography.

Exclusion Criterion: Not New

The chromatography equipment and procedures used by lab technicians have not changed substantially in the last decade. Column chromatography has been a tool of technicians and chemists since the early 1900s. Paper chromatography began in the 1930s, followed by gas chromatography in 1952 and high pressure liquid chromatography in 1970. The only recent changes in chromatography have been at the chemist level.

Crystal Manufacturing Occupations

Job Duties

Crystal technicians direct, oversee and monitor the complete crystal production process, including growing, polishing, fabricating and assembling. They must be able to perform all the operations associated with these processes and to "trouble shoot" and make any necessary adjustments to the process to assure quality products. They frequently perform first line management functions; e.g., foreman.

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[1] Meleen et al., op. cit.

Crystal growers are skilled workers who prepare semiconductor raw materials, such as silicon and germanium, for processing. They operate a great number of different manual and automated machines involved in the growing of crystals, since each kind of crystal requires specialized equipment.

Crystal polishers are highly skilled workers who operate the machines that transform rough crystals into a highly polished sheet suitable for use in a variety of semiconductor devices. They use micrometers and other precision measuring devices, polishing and slicing equipment and optical devices.

Crystal fabricators are skilled workers who perform functions similar to crystal polishers. Depending on the industry and job setting, the polisher converts crystals into sheet form; and the fabricator performs the final cutting, shaping and other necessary operations to transform the crystal sheet into individual items, such as solar cells. In many settings, polishing and fabricating are one job.

Crystal assemblers are skilled workers who work primarily in the solar energy industry connecting individual solar cells into larger assemblies called "arrays" (analogous to batteries). They use standard electronic equipment such as electrical measuring devices and soldering tools.[1]

Exclusion Criterion: Insufficient Demand

Silicon and germanium crystal manufacturing is becoming a capital intensive process because of automation. Thus the crystal manufacturing occupations will not continue to emerge but rather decrease in employment demand. Furthermore, no manufacturers are located or are expected to locate in Illinois.

Electromechanical Technician

Job Duties

Electromechanical technicians install, maintain and repair complex machinery, especially industrial, that incorporate mechanical, hydraulic, pneumatic, electronic, optical and thermal devices.

Exclusion Criterion: Existing Curriculum

The Illinois Community College Board has approved electromechanical technology programs at five community colleges; four other colleges intend to implement programs between 1978 and 1981.

Heat and Power Engineer

Job Duties

A prior study of new and emerging occupations described the duties of a Heat and Power Engineer as maintaining efficient operation of a large building, involving heating and cooling, energy conservation, plumbing, electrical work and fire control systems.[1] Most work in institutional buildings and complexes which house persons or in industrial buildings used for manufacturing, processing or storage of products and materials.

Exclusion Criterion: Not New

Heat and Power Engineers emerged in the nineteenth century as evidenced by the formation of the National Association of Power Engineers approximately 100 years ago. More widely known as power engineers or stationary engineers, they are dispersed throughout the nation and economy, numbering 1,500,000 strong.[2] Their responsibilities and duties have not changed significantly within the past decade, nor are they expected to change within the foreseeable future in a way that would give birth to a new occupation.

Nuclear Instrumentation Technician

Job Duties

The Nuclear Instrumentation Technician troubleshoots, maintains, calibrates and repairs a wide range of instruments which measure heat, pressure, flow and neutron flux in a nuclear power plant.

Exclusion Criterion: Not New and Existing Curriculum

The occupation of NIT has been in existence since the 1950s. Furthermore, a two-year associate degree in electronics technology is the primary requirement for the job; electronic service curricula have been approved at 27 Illinois community colleges.

Nuclear Material Processing Technician

Job Duties

A Nuclear Material Processing Technician ensures that in a nuclear facility radioactive materials are safely handled, processed, and stored.

Exclusion Criterion: Education Requirements

The one significant employer of NMPTs in Illinois is Commonwealth Edison, which hires them into entry-level positions within a bargaining unit. The only educational requirement is a high school degree.

Nuclear Qualified Welder

Job Duties

A Nuclear Qualified Welder joins metal components of a nuclear project using welding processes such as oxyacetylene, gas metal arc, gas tungsten arc and shielded metal arc.

The title Nuclear Qualified Welder signifies that a person has passed a certification test based on American Society of Mechanical Engineers, American Welding Society, and American National Standard Institute codes. Usually administered by the employer, passage of the test enables a welder to work on nuclear projects using the materials, and welding technique used for the test.

Nuclear Qualified Welder is not a widely used title in industry. Usually nuclear qualified welders work under other titles such as Pipefitter-Welder, Steamfitter Welder or Boilermaker. When not employed on nuclear projects, the welders work in the more traditional settings of their occupation.

Exclusion Criterion: Existing Curriculum

Welding curricula have been approved at 33 Illinois community colleges. The colleges are geographically spread across Illinois, thus constituting a solid base on which to train welders who are interested in working on nuclear projects. Because of the high standards in nuclear welding, several years of experience are usually required after graduation before a welder has attained the skill level necessary to pass a certification test.

[1]Description obtained from Meleen et al., op. cit.

[2]J. C. Martini, "Profile of the Power Engineer," *National Engineer*, May, 1977, pp. 8-11.

Nuclear Quality Assurance Inspector

Job Duties

The Nuclear Quality Assurance Inspector ensures that prescribed standards are met and procedures are followed at any component manufacturing company, construction site or power plant involved in the construction or operation of a nuclear facility. The inspector implements a program for quality assurance audits, performs the audits, reviews procedures and maintains an awareness of Federal regulations pertaining to nuclear power.

Exclusion Criterion: Insufficient Demand

The present number of NQAIs, the occupation's expected growth rate and the occupation's educational and experiential requirements combine to create a lack of demand for associate-degree inspectors. From 200 to 300 NQAI are employed today in Illinois. the estimated growth rate for inspectors is approximately six percent. Assuming the 300 figure to be correct, the six-percent growth rate and normal attrition might justify development of a NQAI program were several other circumstances not present. However, a significant number of the inspector positions require knowledge obtainable only through a four-year engineering degree program. Also, some firms fill their inspector positions only by internal promotion of employees who have proven their competence in tangential positions. Taken as a whole, the demand for NQAI in Illinois is too low to warrant development of a training program.

Power Reactor Technician

Job duties

Power Reactor Technicians work in nuclear power plants. They control nuclear reactors that produce steam for generating electric power and coordinate the operation of auxiliary equipment.

Exclusion Criterion: Insufficient Demand

The only major employer of Power Reactor Technicians in Illinois, Commonwealth Edison, hires technicians into entry-level positions within a bargaining unit with the only requirement being a high school diploma. Additional education and training is provided by the company (for which academic credit is given by Joilet Junior College). The only other nuclear-oriented power company based in Illinois is Illinois Power which has a single nuclear reactor under construction. The reactor is expected to become operational around 1983. Thus at present there is little need for training programs for power reactor technicians.

Radiation Protection Technician

Job Duties

A Radiation Protection Technician surveys equipment, work areas and personnel to detect radioactive contamination in a nuclear reactor facility.

Exclusion Criterion: Insufficient Demand

Presently, there are approximately 55 Radiation Protection Technicians employed in Illinois. In five years the number will grow to about 90, primarily because of the six nuclear reactors under construction by Commonwealth Edison. The low number presently employed and the minimal growth rate do not justify development of a curriculum to train Radiation Protection Technicians in Illinois.

Child Advocate

Job Duties

The occupational title of Child Advocate covers a broad range of differing requirements for educational preparation, job duties, and employers or occupational settings. The child advocate usually works directly with children and/or parents in a problem-solving capacity pertaining to the provision of relevant social services or to questions of legal privileges (case advocacy). The advocate may also work as a class advocate who identifies the common problems or concerns of groups of children to bring about problem resolutions and fill unmet needs.

Exclusion Criterion: Education Requirements

Child advocacy is a component of a large number of social service, health-related, education or correctional occupations that do not deal exclusively with children. For example, advocates who are employed by mental institutions, agencies for the physically or mentally handicapped, judicial or correctional systems may work with clients of all ages.

The child advocates in Illinois are often lawyers or individuals with a degree of formal training in social work, general education, guidance and counseling, physical or mental therapy, criminology, special education or other fields. At the other extreme individuals with little or no formal training perform advocacy duties through a community organization, CETA program, etc., in the street worker model. However, the majority of advocates employed presently in positions other than short-term government-funded projects have at a minimum a four-year college degree.

With the emphasis of recent federal legislation such as the Mathias Amendment to the Elementary and Secondary Education Act of 1974 (PL 93-380) and the Education of All Handicapped Children Act of 1975 (PL 94-142), more opportunities for graduates of two-year programs in Human Services with a specialty in child advocacy could become available. In periods of recession or reduced public spending, however, child advocacy duties or positions are likely to be handled by currently employed civil servants or recent baccalaureate degree graduates.

Dietetic Technician

Job Duties

The Dietetic Technician, working under the supervision of a dietitian or an administrator and a consultant dietitian, assists in providing food service management or nutritional care services. Examples of typical activities include planning menus based on established guidelines; monitoring food service for conformance with quality standards; and guiding individuals and families in food selection, food preparation and menu planning based on nutritional needs. In 1971 the American Dietetic Association defined the occupation of dietetic technician and established standards for educational programs.

Exclusion Criterion: Existing Curricula

As of December, 1977, eight Illinois community colleges had approved curricula for dietetic technicians, and a ninth college has approval for a program in 1979. The colleges thus are aware of the demand for Dietetic Technicians and are implementing curricula to satisfy it.

Physical Security Technician

Job Duties

Meleen stated that Physical Security Technicians apply the theories and techniques of security and loss prevention to the **design, installation, maintenance** and **monitoring** of sophisticated industrial monitoring systems and fire and burglar alarm devices and systems.[1] They may provide technical assistance to builders or architects integrating protective systems into new buildings, or they may analyze the requirements for and install protective systems for existing structures.

Exclusion Criterion: Insufficient Demand

Industry sources did not recognize the physical security technician as described above as an existing or new and emerging occupation in the security and fire/burglar alarm area. The functions noted (design, installation, maintenance and monitoring) are often handled by more than one organization. A security consultant may design the system, a technician working for an independent contractor install and maintain it and an in-house guard monitor it. In general, while security equipment has increased in sophistication over the last decade, the basic job functions have not changed and there are no widely recognized new and emerging occupations at the technician level.

Public Safety Communication Operator

Job Duties

Public Safety Communication Operators receive requests for police, fire, medical and other types of assistance, often from persons in emergency situations. The operator queries the caller to collect the information needed to determine the level and type of assistance required. The operator then either makes the determination and dispatches aid or gives the information to a dispatcher. Equipment commonly used includes telephones, radio-communication hardware, teletype machines and in larger jurisdictions, computers. The operator maintains records concerning calls and actions taken.

Exclusion Criterion: Not New and Educational Requirements

Operators have been performing these services since radios were placed in police cars in the 1920s. While the equipment has increased in sophistication, the basic nature of the job remains unchanged.

Less than six months is required to train an operator. The State Police Academy and the Associated Public-Safety Communications Officers, Inc. both offer two week courses. Lake Land College has a four-level certificate program for dispatchers. Each level requires six quarter hours; thus, the Basic Dispatcher Certificate can be obtained in one quarter, or approximately three months. Lake Land also has a two-year A.A.S. curriculum for Electronics Communications Dispatcher designed to train managers of communication centers.

[1]Meleen, et al., op. cit.

Recoverable Materials Coordinator

Job Duties

Concern over dwindling natural resources and the potential of monetary earnings have focused attention on recycling of glass, paper, aluminum and other materials. It was suggested that local government waste disposal authorities may be hiring coordinators to oversee recycling efforts. However, no authorities which employed coordinators could be identified; therefore, information on typical duties is not available.

Exclusion Criterion: Insufficient Demand

The technology necessary for cost-effective recycling is only beginning to emerge. Maintenance problems must be resolved before there is widespread adoption of recycling by municipalities. The future employment and training needs of recycling personnel are uncertain. Currently, in Chicago recycling is the responsibility of an engineer whose duties also include refuse combustion and waste disposal. In summary, recycling specialists have not emerged and are not forseen in the near future.

Security Officer for Airports

Job Duties

Transportation center Security Officers inspect persons, packages and areas and maintain security standards at airports. The officers are employed by private security firms under contract to the airlines or airport. These officers should not be confused with the sworn police officers also found at airports who have broader law enforcement responsibilities and provide support to security officers if security violations are discovered.

Exclusion Criterion: Education Requirements

A spokesperson for the U.S. Federal Aviation Administration stated that one day of formal instruction coupled with on-the-job training are the educational requirements for security officers.

Wastewater Treatment Plant Occupations

Job Duties

The Wastewater Treatment Plant Technician tends pumps, conveyors, blowers, chlorinators, vacuum filters, and other equipment to decontaminate sewage by settling, aeration, and sludge digestion. The Wastewater Treatment Plant Operator supervises technicians and other workers engaged in operating and maintaining equipment in a wastewater treatment plant. In facilities serving small populations the responsibilities and duties of the technician and operator are often performed by one person.

Exclusion Criterion: Existing Curriculum and Not New

Wastewater treatment plants date back to the 1920s. The responsibilities and duties of technicians have changed little within the last decade.

Wastewater treatment plant training curricula have been approved at 14 Illinois community colleges.

IV. CONCLUSIONS AND RECOMMENDATIONS

This study has identified seven occupations which can be considered as new and emerging occupations within the State of Illinois. Those occupations are worthy of immediate attention by vocational and technical education administrators within the State. Each of the seven occupations is appropriate for secondary and/or post-secondary vocational education preparation each shows a considerable demand for qualified personnel and each has a lack of existing curricula preparing individuals for entry into the occupation.

In addition to these seven new and emerging occupations, twelve other occupations were identified which show promise for eventual designation as new and emerging; however, there remain some uncertainties regarding the current and future needs for vocational preparation in those occupational areas. In some instances the uncertainties result from pending legislation or certification requirements which will have a marked influence on the future of the occupation. In other instances the occupation was considered to be too new to obtain a realistic estimate of future employment opportunities. Finally, some of these potentially new and emerging occupations fell slightly short of the employment demand criterion of one hundred job openings over the next five years. While not classified at this time as new and emerging occupations, they are deserving of further consideration by vocational educators within the State.

Forty-five other occupations that were investigated clearly did not meet one or more of the criteria for designation as a new and emerging occupation. Some of these occupations were excluded from further investigation due to the amount of training required. Others were not pursued further because curricula were already in existence in Illinois to prepare students for entry into those occupations. Still others were not pursued further because of insufficient demand, or because they were not new occupations. The exclusion of these occupations from further investigation during the course of the study does not imply that they are not appropriate for vocational training; rather, they simply do not qualify as new and emerging occupations.

The following recommendations are classified into three categories. The first category pertains to those occupations which meet the criteria of new and emerging; the second category of recommendations applies to occupations classified as potentially new and emerging; and the third category applies to the occupations which were explored during the study but did not qualify as new and emerging.

Promote curriculum activities for the following seven occupations:

Biomedical Equipment Technician
Halfway House Resident Manager
Industrial Hygiene Technologist
Podiatric Assistant
Solar Energy Technician
Swine Confinement Facility Assistant Manager
Therapeutic Recreation Technician

Each of the above occupations is new and emerging within the State of Illinois. As such, they represent occupational opportunities which could be made available to students through the development and inauguration of appropriate vocational curricula.

Curriculum development, as used in this context, should include the identification and acquisition of existing curricula developed in other States as well as supportive materials such as competency requirements for entry to the occupations. Most, if not all seven, of the new and emerging occupations are currently being offered as vocational education curricula in some part of the country. Curricular and associated guides which have been developed by others can provide a valuable foundation for vocational educators in Illinois to use in establishing these curricula within the State.

After completion of the acquisition of existing curriculum materials they should be reviewed to determine their applicability to State and local needs. In the event that the existing materials are not deemed adequate for one or more of the new and emerging occupations, consideration should be given to supporting the curriculum development activities which are needed. This phased approach to curriculum development will allow for a considerable savings of fiscal resources by building upon the curriculum development activities previously performed by others.

Upon completion of curriculum development activities, dissemination activities should be initiated to facilitate the inauguration of curricula for new and emerging occupations.

The inauguration of curricula for new and emerging occupations can be greatly facilitated through a targeted dissemination process. The seven new and emerging occupations do not consist entirely of all newly emergent occupational tasks. Rather, in many instances they overlap with more established occupations. This overlap is also likely to extend to existing curricula. As a result, inauguration of curricula for new and emerging occupations can be expedited by targeting dissemination activities to those schools, area vocational technical centers and community colleges which already have the foundation for offering one or more of the new curricula. This foundation will consist of the existing facilities, equipment, staff resources and curricular offerings which can be built upon when installing the new curricula. Existing curricula in Illinois which are considered to be supportive of the seven new and emerging occupations are presented below:

Biomedical Equipment Technician:
Biomedical Technology
R. N. Nursing
Surgical Technology
Electronic Service Technician
Electromechanical Technician
Industrial Maintenance

Halfway House Resident Manager:
Accounting
Business and Supermarket Management
Management/Marketing Mid-Management
Social Worker Aide/Director
Social Service
Mental Health

Industrial Hygiene Technician:
Occupational Safety
Industrial Engineer Technician
Environmental Control
R. N. Nursing
Practical Nursing

Podiatric Assistant:
R. N. Nursing
Radiologic Technician
Medical Office Assistant
Accounting
Secretarial Science
Medical Secretary

Solar Energy Technician:
Air Conditioning, Refrigeration and Heating
Building Construction Technician
Construction Management Technician
Architectural Engineering
Mechanical and Engineering Technician
Engineering Aide
Industrial Maintenance

Swine Confinement Facility Assistant Manager:
Agriculture Business
General Business
Management/Marketing Mid-Management
Marketing
Finance and Credit
Veterinary Technician
Agricultural Technician

Therapeutic Recreation Technician:
Mid-Management
Recreational Leadership
Practical Nursing
R. N. Nursing
Occupational Therapy
Mental Health
Physical Therapy

A second consideration in the targeting of dissemination activities should be the projected employment opportunities within the geographic area which the curriculum will serve. Regional projections for each of the seven new and emerging occupations have been presented in the previous section of this report. Utilizing those projections in conjunction with information on existing curriculum, staff and facility resources will serve to identify the schools and community colleges which should be focused upon during dissemination activities.

Develop a monitoring system to review the following twelve occupations classified as potentially new and emerging:

Cardiopulmonary Technician/Technologist
Diagnostic Medical Sonographer
Expanded Function Dental Auxiliary
Home Health Aide
Multi-Competency Technician
Ophthalmic Medical Assistant
Physician's Assistant
Tumor Registrar
Laser/Electro-Optics Technician
Housing Rehabilitation Specialist
Energy Efficient Technician
Automotive Electronics Technician

The evolutionary process by which new and emerging occupations come into existence also produces occupations which do not flourish or survive. As a result, it is oftentimes difficult to predict the short-term future of an evolving occupation. The twelve occupations listed above are evolving occupations; their current status and futures are uncertain. Each shows promise of becoming a new and emerging occupation, but none has yet to emerge. This promising nature of these occupations leads us to recommend that a monitoring system be established to review their status over the coming years.

The occupational descriptions presented in the previous section of this report identify the specific factors which resulted in the occupations being classified as potentially new and emerging. In those instances where uncertainties in existing employment demand were the primary factor, a more thorough investigation of employment opportunities might suffice to clarify the employment potential of the occupation. Based on the large number of occupational areas investigated during the present study we were unable to commit a major share of project resources to any single occupation; given the resources which were available we could not ascertain a significant demand for any of these potentially new and emerging occupations. However, several of these occupations approached the demand criterion for inclusion as a new and emerging occupation; these included Diagnostic Medical Sonographer and Tumor Registrar. Conflicting estimates of demand were obtained for the following occupations: Cardiopulmonary Technician/Technologist, Ophthalmic Medical Assistant, Laser/Electro-Optics Technician and Housing Rehabilitation Specialist.

Another group of potentially new and emerging occupations were so classified because of pending legislation, regulations or certification requirements which could have a significant impact on the future of the occupations. The legislative or regulatory requirements pertaining to these occupations should be monitored to verify their potential as new and emerging occupations. These occupations include Expanded Function Dental Auxiliary, Home Health Aide, Physician's Assistant and Energy Efficiency Technician

Finally, uncertainties in technological change account for the inclusion of Automotive Electronics Technicians in this category of occupations. In the health area, the Multi-Competency Technician is still a new concept which has yet to be accepted by professionals; as a result, the future of the occupation remains uncertain at this time. Both of these occupations should be reviewed for reconsideration as new and emerging occupations during the next few years.

Occupations excluded from further consideration as new and emerging should be reviewed for their curricular applications.

This study, by design, was intended to focus upon new and emerging occupations. In the process of identifying such occupations a wide variety of occupational areas was explored. Many occupations which were investigated were subsequently excluded from further consideration as new and emerging: some were older occupations, some lacked sufficient demand, some required too little or too much training, and others were excluded because existing curricula within the State were currently preparing people for entry into the occupations. These occupations should not be dismissed from further consideration by vocational educators within the State. Particular attention should be given to the occupations which were excluded because they were not new but for which existing curricula are few or non-existent. Occupations which required too little training to be considered suitable for vocational education curricula might be well-

suited to short-term CETA training programs. Occupations which showed little demand might still be appropriate for a cooperative program with area employers. Finally, those occupations which were excluded because of existing curricula within the state should be reviewed in light of the potential for expansion in other schools or community colleges.

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VI. APPENDICES

APPENDIX A

INTERVIEW GUIDES

Appendix A.1. Organizations Matched to Vocational Program Areas
Organizations Matched to Trends

Appendix A.2. Organizations Matched to Specific Occupations

Interview Guide #3

Organizations Matched to Vocational Program Areas

Vocational Program _____ Phone #: _____

Person/Organization Called: _____

_____

Date of Call: _____; Time: Begin _____; End _____.

Call Back On: _____

"Hello, Mr./Ms. _____. This is _____, and I'm calling for CONSERVA, Inc., which is an educational research firm located in Raleigh, N.C. We are conducting a survey for the Illinois Office of Education to identify new or emerging occupational areas for which vocational training programs might be needed."

"We are trying to identify those occupations which have come into existence over the past several years as a response to recent legislation, technological changes, job restructuring, or changes in social services. We are contacting your organization because we feel that you might be able to provide us with information which would be valuable to the Office of Education in planning new training programs. The occupations that we are interested in would require less than a four year education. For example, Solar Energy Technician and Small Computer Operator could be considered new and emerging occupations."

Q1 "What occupations are you aware of which have come into existence within the past 5 years or so?"

NONE: *READ CARD 2*
YES (from CARD 2): *GO TO FIRST*
NO (from CARD 2): "Who do you know that might be helpful in identifying new occupations in the _____ area?"

Name	Location	Phone

CLOSING: "Thank you for your assistance Mr./Ms. _____. I appreciate having had the opportunity to talk with you. Good-bye."

FIRST: _____ *IF ONLY ONE, GO TO Q2*

SECOND, THIRD, ETC.: _____ _____

_____ _____

_____ _____

"Which occupation are you most familiar with?" *CIRCLE: GO TO Q2*

Q2 "About how long have people been employed as _____, or in other words, how long has the occupation been in existence?"

Probe:
Sex barriers
Wages
Part/Full-tim

Q3 "What are the major job duties of people who are employed as _____?"

Q4 "What types of organizations or industries tend to hire people for the job of _____?"

Q5 "Do you know of any specific employers that I might contact for additional information?"

Name Location Phone

Q6 "What type of training or education is generally required to become a _____?"

Q7 "Where do _____ usually get that training?"

Q8 "If a new program for training _____ was to be established, do you think that it should be offered at the high school level, by community colleges, or in a four year college or university?"

Q9 "How long, in terms of years or months of training, do you think it would take to prepare someone to become a _____?"

Q10 "How many people would you estimate there are employed as _____ within the State of Illinois at this time?"

Q11 "Current estimates indicate that in five years the average employment in all occupations in Illinois will increase approximately six percent. What would you estimate the growth rate will be for _____ over the next five years?" (*If respondent can not give a percentage figure, ask,* "Do you think the growth in employment will be faster, slower, or about the same rate as the average for all occupations?")

Q12 "Could you suggest any related occupations or industries whose growth in employment would reflect the future employment of _____?"

Q13 "What other factors might reflect the future demand of _____?"

Q14 "Finally, what organizations or individuals do you know of that would also be knowledgeable of the occupation _____?"

Name	Location	Phone

IF MORE THAN ONE JOB MENTIONED:

Q15 "You mentioned several other occupations. Do you have time now to discuss them or would you prefer that I call back later?"

DECLINES: *GO TO Q16*

NOW: Q15.1 "The other occupations you noted were _____. Which of these occupations are you most familiar with?" *CHECK: GO TO Q2*

LATER: Q15.2 "When would be convenient for you?"

Date: _____ Time: _____; *GO TO Q16*

Q16 "Thank you so much for your assistance. You've been extremely helpful. Is there any other information you might be able to provide me concerning _____ which you feel would be helpful to the Illinois Office of Education?"

IF CALL BACK: "I look forward to talking with you again Mr./Ms. _____ on _____ at _____.

"Thank you again, goodbye." (END)

"It might help if I give you a little more information about what we're looking for. As I mentioned earlier, an occupation begins to emerge when a new function is performed in response to a need in society. This has been the case in the health field, where physicians' assistants are emerging as an answer to exorbitant increases in the cost of health care. And frequently the demand for new services is met through the gradual evolution of existing jobs into new occupations. Many functions of the Solar Energy Technician, which I mentioned earlier, are presently being performed by persons trained in heating and air conditioning. As the demand for solar energy facilities increases more and more specialization is likely to take place. Do these processes help you think of any emerging occupations?"

OR

"Would it help if I give you a little time to think about it and call back in a day or two?"

Interview Guide #2

Organizations Matched to Technological, Legislative, Societal, Economic Trends

Trend: _____ Phone #: _____

Person/Organization Called: _____

_____

Date of Call: _____ Time: Begin _____; End _____

Call Back On _____

"Hello, Mr./Ms. _____. This is (*your name*) and I'm calling for CONSERVA, Inc. which is an educational research firm located in Raleigh, N.C. We are conducting a survey for the Illinois Office of Education to identify new occupational areas for which vocational education programs might be needed.

As a part of this study we are exploring the impact of (*cite trend*) on creating new occupations. I'm contacting your organization because I felt that you would be knowledgeable concerning the occupational impact of (*cite trend.*)"

IF RESPONDENT DOES NOT KNOW OCCUPATIONAL IMPLICATIONS OF TREND

"Who do you know of that might be helpful in documenting the impact of (*cite trend*) on occupations?"

Name	Location	Phone

"Thank you for your assistance. I appreciate having had the opportunity to talk with you." (END)

Q1 "What do you feel the impact of that _____ has been in terms of creating new occupations?" (Allow for general discussion)

Q2 "Do you know of any specific occupation that has been created in response to _____?" (If YES, go to Q4)

(NO) "Who would you suggest I contact for additional information on the occupational implications of _____?"

Name Location Phone

"Thank you for your assistance. I appreciate having had the opportunity to talk with you." (END)

Q3 "What is the title of the occupation?"

Q4 "About how long have people been employed as _____, or in other words, how long has the occupation been in existence?"

Q5 "What are the major job duties of people who are employed as _____?"

Probe:
Sex barriers
Wages
Part/Full-time

Q6 "What types of organizations or industries tend to hire people for the job of _____?"

Q7 "Do you know of any specific employers that I might contact for additional information?"

Name Location Phone

Q8 "What type of training or education is generally required to become a _____?"

Q9 "Where do _____ usually get that training?"

Q10 "If a new program for training _____ was to be established, do you think that it should be offered at the high school level, by community colleges, or in a four year college or university?"

Q11 "How long, in terms of years or months of training, do you think it would take to prepare someone to become a _____?"

Q12 "How many people would you estimate there are employed as _____ within the State of Illinois at this time?"

Q13 "Current estimates indicate that in five years the average employment in all occupations in Illinois will increase approximately six percent. What would you estimate the growth rate will be for _____ over the next five years?" (*If respondent can not give a percentage figure, ask,* "Do you think the growth in employment will be faster, slower, or about the same rate as the average for all occupations?")

Q14 "Could you suggest any related occupations or industries whose growth in employment would reflect the demand for _____?" (*If occupation or industry given, ask for elaboration.*)

Q15 "Finally, what organizations or individuals do you know of that would also be knowledgeable of the occupation _____?"

Name	Location	Phone

Q16 "Thank you so much for your assistance. You've been extremely helpful. Is there any other information you might be able to provide me concerning _____ which you feel would be helpful to the Illinois Office of Education?"

"Thank you again, goodbye." (END)

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Appendix A.2

Interview Guide #1

Organizations Matched to Specific Occupations

Occupation: _____ Phone #: _____

Person/Organization Called: _____

_____

Date of Call _____; Time: Begin _____; End _____.

Call Back On _____

"Hello, Mr./Ms. _____. I'm (*your name*) calling for CONSERVA, Inc., which is an educational research firm located in Raleigh, North Carolina. We're conducting a survey for the Illinois Office of Education to identify new occupations for which vocational education programs may be needed. I'm contacting your organization because I felt that you might be able to provide us with information on the occupation of (name of occupation) (*Describe as necessary*)

Q1 "Are you familiar with (name of occupation). (YES Q2)
(NO) "Who might be able to provide me with any information on that occupation?"

Name Location Phone

(DOESN'T KNOW)

"Thank you for your assistance. I appreciate having had the opportunity to talk with you. Good -bye." (END)

Q2 "About how long have people been employed as _____, or in other words, how long has the occupation been in existence?"

Q3 "What are the major job duties of people who are employed as _____?"

Probe:
Sex barriers
Wages
Part/Full Time

Q4 "What types of organizations or industries tend to hire people for the job of _____?"

Q5 "Do you know of any specific employers that I might contact for additional information?"

Name	Location	Phone

Q6 "What type of training or education is generally required to become a _____?"

Q7 "Where do _____usually get that training?"

Q8 "If a new program for training _____ was to be established, do you think that it should be offered at the high school level, by community colleges, or in a four year college or university?"

Q9 "How long, in terms of years or months of training, do you think it would take to prepare someone to become a _____?"

Q10 "How many people would you estimate there are employed as _____ within the State of Illinois at this time?"

Q11 "Current estimates indicate that in five years the average employment in all occupations in Illinois will increase approximately six percent. What would you estimate the growth rate will be for _____ over the next five years?" (*If respondent can not give a percentage figure, ask,* "Do you think the growth in employment will be faster, slower, or about the same rate as the average for all occupations?")

Q12 "Could you suggest any related occupations or industries whose growth in employment would reflect the demand for _____?" (*If occupation or industry given, ask for elaboration.*)

Q13 "Finally, what organizations or individuals do you know of that would also be knowledgeable of the occupation _____?"

Q14 "Thank you so much for your assistance. You've been extremely helpful. Is there any other information you might be able to provide me concerning _____ which you feel would be helpful to the Illinois Office of Education?"

"Thank you again, goodbye." (END)

APPENDIX B

Demand Estimation Procedures

Biomedical Equipment Technician

Two components of five-year employment demand for BMETs were estimated: expansion and replacement.

Expansion. The growth of the BMET field could not be linked to any established occupation for which there are employment projections. However, employment growth within the hospital setting could be linked to hospital size. Sources agreed that for every 100 beds within a hospital a BMET is required. Utilizing data collected by the American Hospital Association,[1] employment needs were calculated by facility based on a ratio of 1 BMET per 100 beds. Psychiatric, children's psychiatric, and mental retardation institutions were excluded from the computations. These estimates were then collapsed by analytic region to provide regional employment needs. Current employment of BMETs in Illinois was estimated at 250. Statewide employment was distributed by region based on the regional distribution of employment needs; i.e., hospital beds. Expansion was then calculated by region as the difference between total employment needs and current employment.

Replacement. To obtain estimates of demand due to replacement it was assumed that replacement rates for BMETs paralleled those of electronic technicians. These rates were available from the *Illinois Manpower Projections* and were calculated as the number of positions created by replacement divided by total current employment. The rates were then applied to current BMET employment estimates to obtain demand due to replacement.

Total demand was computed by summing the derived expansion and replacement estimates. The results of the estimation procedures are portrayed in Table 1.

Table 1

Derivation of Projected Five-Year Employment Requirements for Biomedical Equipment Technician

Region	Employment	Total Employment Needs	Expansion	Five-Year Replacement Rate for Electronics Technician (in %)	Replacement	Total Total Demand (1978-83)
1	7	15	8	6.4	0	8
2	172	359	187	6.2	11	198
3	3	7	4	7.1	0	4
4	5	10	5	5.7	0	5
5	3	7	4	7.7	0	4
6	9	18	9	5.8	1	10
7	3	6	3	6.5	0	3
8	13	27	14	6.2	1	15
9	0	1	1	12.5	0	1
10	4	8	4	5.6	0	4
11	8	16	8	6.0	0	8
12	2	5	3	0.0	0	3
13	12	26	14	5.9	1	15
14	2	5	3	0.0	0	3
15	1	2	1	0.0	0	1
16	0	0	0	0.0	0	0
17	3	6	3	4.3	0	3
18	0	0	0	0.0	0	0
19	0	0	0	0.0	0	0
20	1	2	1	0.0	0	1
Total	250	520	270	6.2	16	286

Note: Rounding may cause discrepancies in totals.

Diagnostic Medical Sonographer

As with the BMET, occupation estimates of five-year demand for diagnostic medical sonographers were calculated by summing estimates of expansion and replacement.

Expansion. The ratio of hospital beds to ultrasound machines was judged to be 300 to 1. With estimates of 2 sonographers per machine complete linkages between diagnostic medical sonographers and hospital size were established. Needs for ultrasound machines were calculated by facility using hospital bed data from the *AHA Guide to the Health Care Field,* and these figures were converted to employment needs by applying the 2:1 ratio. Facility needs were then summed by analytic region. Current employment, estimated at 150-200, was distributed by region as the employment needs. Expansion was calculated as the difference between employment needs and number currently employed.

Replacement. Five-year replacement rates for health technologists/technicians, available from the *Illinois Manpower Projections,* were assumed to be representative of diagnostic medical sonographers. These rates were applied by region to estimates of current employment to obtain projected five-year replacement, the second component of total demand.

The steps of the demand estimation process for diagnostic medical sonographer are presented in Table 2.

[1] *American Hospital Association Guide to the Health Care Field* (Chicago, IL: American Hospital Association, 1976).

Table 2

Derivation of Projected Five-Year Employment Requirements for Diagnostic Medical Sonographer

Region	Employment Minimum	Employment Maximum	Total Employment Needs	Expansion 200 Employed	Expansion 150 Employed	Five-Year Replacement Rate for Health Technologist Technician (in %)	Replacement 150 Employed	Replacement 200 Employed	Total Demand (1978-1983) Minimum	Total Demand (1978-1983) Maximum
1	3	4	4	0	1	30.2	1	1	1	2
2	117	156	156	0	39	29.9	35	47	47	74
3	0	0	0	0	0	28.4	0	0	0	0
4	1	2	2	0	1	29.9	0	1	1	1
5	0	0	0	0	0	28.4	0	0	0	0
6	6	8	8	0	2	29.9	2	2	2	4
7	0	0	0	0	0	29.8	0	0	0	0
8	8	10	10	0	2	29.6	2	3	3	4
9	0	0	0	0	0	28.6	0	0	0	0
10	3	4	4	0	1	30.3	1	1	1	2
11	5	6	6	0	1	29.7	1	2	2	2
12	1	2	2	0	1	28.9	0	1	1	1
13	6	8	8	0	2	29.7	2	2	2	4
14	0	0	0	0	0	29.0	0	0	0	0
15	0	0	0	0	0	29.3	0	0	0	0
16	0	0	0	0	0	26.3	0	0	0	0
17	0	0	0	0	0	28.0	0	0	0	0
18	0	0	0	0	0	28.6	0	0	0	0
19	0	0	0	0	0	26.2	0	0	0	0
20	0	0	0	0	0	28.7	0	0	0	0
Total	150	200	200	0	50	29.8	45	60	60	95

Note: Rounding may cause discrepancies in totals.

Industrial Hygiene Technologist

Estimates of the demand for industrial hygiene (IH) technologists were derived from (1) data on the current number of professional industrial hygienists in Illinois, (2) estimates of the current and anticipated ratios of IH technologists to professionals and (3) the projected growth rate for professional industrial hygienists.

Information obtained from the American Industrial Hygiene Association indicated that there are currently 144 professional industrial hygienists in Illinois, and fewer than that number of industrial hygiene technologists. At the present time (1978) there is an estimated need for two technologists for each IH professional. Over the next five years this ratio is expected to increase to five technologists for each professional. During the same five-year period the number of IH professionals is expected to increase by 12% per year (the number of IH professionals increased by 16% between 1976 and 1977). By applying these estimates the following employment projections were obtained:

Year	IH Professionals	IH Technologists (@ 2 to 1)	IH Technologists (@ 5 to 1)
1978	144	288	720
1979	161	322	805
1980	181	362	905
1981	202	404	1,010
1982	227	454	1,135
1983	254	508	1,270

The ratio of technologists to professional industrial hygienists, as previously noted, is expected to change from 2:1 to 5:1 over the next five years. The above table reflects the employment projections for each of those ratios. The 2 to 1 ratio is thus a conservative estimate during the latter years of the five-year period; while the 5 to 1 ratio is an over-estimate for the early years of the five-year period.

Industrial hygiene technologists are hired by the same types of large companies that employ industrial hygienists and industrial engineers. The *Illinois Manpower Projections* do not provide data on the geographic distribution of industrial hygienists; however, information is provided on the distribution of industrial engineers. Based on that distribution the projected statewide demand for IH technologists was allocated to the twenty substate planning regions with Illinois. The data used in deriving those regional estimates are provided in Table 3.

Ophthalmic Assistant/Technician

Linkages were readily obtained between ophthalmic support personnel and an established parent occupation—the ophthalmologist. Sources agreed that every ophthalmologist is capable of employing either an ophthalmic assistant or technician. Though employment projections for ophthalmologists could not be obtained from *Illinois Manpower Projections*, the number currently employed was available in an American Board of Medical Specialties publication.[1] The five-year growth rate for physicians was then calculated, utilizing *Illinois Manpower Projections*, as the number of positions created through expansion and replacement divided by total base employment. Assuming parellel growth rates among the physician specialties, this growth rate was applied to the base employment figures for ophthalmologists yielding five-year demand estimates for ophthalmologists or, based on the one-to-one ratio of parent to new occupation, for ophthalmic assistants and technicians. (See Table 4).

Podiatric Assistant

The podiatric assistant was linked, via a ratio of 2 to 1, to its parent occupation, the podiatrist. Total demand for podiatric assistants was estimated simply by doubling the five-year demand for podiatrists, available in *Illinois Manpower Projections*. The results are shown by region in Table 5.

[1]American Board of Medical Specialties, *Directory of Medical Specialists* (Chicago, IL: Marquis Who's Who, Inc., 18th edition, 1977-1978).

Table 3

Derivation of Projected Five-Year Employment Requirements for Industrial Hygiene Technologist

Region	1980 Employment of Industrial Engineers	Percent Statewide Employment	Total Demand (1978-1983) Minimum	Maximum
1	1,180	8.02	41	102
2	10,453	71.06	360	902
3	57	.39	2	5
4	664	4.51	23	57
5	45	.31	2	4
6	551	3.75	19	48
7	158	1.07	5	14
8	347	2.36	12	30
9	36	.24	1	3
10	196	1.33	7	17
11	231	1.57	8	20
12	16	.11	1	1
13	563	3.83	19	49
14	15	.10	1	1
15	76	.52	3	7
16	14	.09	0	1
17	59	.40	2	5
18	9	.06	0	1
19	17	.12	1	2
20	23	.16	1	2
Total	14,710	100.00	508	1,270

Note: Rounding may cause discrepancies in totals.

Table 4

Derivation of Projected Five-Year Employment Requirements for Ophthalmic Assistant/Technician

Region	Number of Certified Ophthalmologists	Five-Year Growth Rate of Physicians (in %)	Total Demand (1978-1983)
1	16	30.1	5
2	297	35.7	106
3	4	25.5	1
4	6	30.1	2
5	4	29.4	1
6	8	28.4	2
7	8	35.4	3
8	24	42.6	10
9	2	27.8	1
10	3	18.7	1
11	11	29.9	3
12	6	24.4	1
13	12	32.9	4
14	2	32.5	1
15	2	23.1	0
16	0	28.0	0
17	6	33.3	2
18	0	34.0	0
19	0	18.9	0
20	0	26.3	0
Total	411	35.0	144

Note: Rounding may cause discrepancies in totals.

Table 5

Derivation of Projected Five-Year Employment Requirements for Podiatric Assistant

Region	Five-Year Demand for Podiatrists	Total Demand (1978-1983)
1	21	42
2	114	228
3	4	8
4	6	12
5	3	6
6	11	22
7	2	4
8	8	16
9	1	2
10	3	6
11	6	12
12	2	4
13	10	20
14	2	4
15	1	2
16	1	2
17	3	6
18	1	2
19	1	2
20	2	4
Total	202	404

Tumor Registrar

Estimates of the demand for tumor registrars were based on the assumption that the five-year growth of the occupation would parallel that of health record technologist/technician (HRTT). Based on *Illinois Manpower Projections*, the five-year demand for HRTT was found to represent 61 percent of the total base employment. Applying this growth rate tc statewide estimates of 100-150 tumor registrars generated a five-year demand ranging from 61-92. The statewide demand was then distributed regionally as that of HRTT. (See Table 6).

Table 6

Derivation of Projected Five-Year Employment Requirements for Tumor Registrar

Region	Five-Year Demand for Health Record Technologist/Technician		Total Demand (1978-1983)	
	Number	Proportion of Statewide Demand	Minimum	Maximum
1	28	.039	2	4
2	530	.734	45	68
3	4	.005	0	0
4	13	.018	1	2
5	4	.005	0	0
6	22	.030	2	3
7	5	.007	0	1
8	40	.055	3	5
9	2	.003	0	0
10	4	.005	0	0
11	25	.035	2	3
12	2	.003	0	0
13	31	.043	3	4
14	3	.004	0	0
15	1	.001	0	0
16	0	.000	0	0
17	4	.005	0	0
18	2	.003	0	0
19	0	.000	0	0
20	2	.003	0	0
Total	722	1.000	61	92

Note: Rounding may cause discrepancies in totals.

Therapeutic Recreation Technician

In 1975 a study was conducted of TRT employment opportunities within the State of Illinois.[1] That study surveyed 9.6 percent of the potential TRT employers in the State. Those employers had 63 associate degree TRT positions in 1975 and anticipated having 169 TRT positions by 1980—an annual expansion rate of 22 percent. By extrapolating from that sample to the total population of potential TRT employers in Illinois, and assuming the same 22 percent expansion rate for the period 1978-1983, the 1978 employment of TRTs was estimated to be 383 and the 1983 employment needs were projected to be 1,035. The difference between the 1978 and 1983 employment estimates represents 652 new TRT positions due to expansion.

The 1978-1983 replacement rate for TRTs was assumed to be the same as that for therapy assistants. Based on data from the *Illinois Manpower Projections*, a five-year replacement rate of 33 percent was derived for therapy assistants. This percentage was applied to the estimated 1978 TRT employment level of 383 to obtain the number of job openings over the next five years due to replacement: 126. By combining this figure with the number of job openings due to expansion (652), a total employment demand of 778 was obtained for the next five years.

The total demand for TRTs was allocated to substate regions on the basis of each region's proportionate employment of therapists, as indicated in *Illinois Manpower Projections*. Therapists rather than therapy assistants were chosen because of their higher incidence, which should reflect more accurately the therapeutic activities within each of the twenty regions. The results of the estimation procedures are presented in Table 7.

[1]J. Kelley, University of Maryland, personal correspondence.

Table 7

Derivation of Projected Five-Year Employment Requirements for Therapeutic Recreation Technician

Region	Therapists	Percent of Total Employment	Total Demand (1978-1983)
1	516	6.16	48
2	4,911	58.61	456
3	86	1.03	8
4	168	2.00	15
5	203	2.42	19
6	254	3.03	24
7	120	1.43	11
8	574	6.85	53
9	96	1.15	9
10	52	0.62	5
11	248	2.96	23
12	77	0.92	7
13	502	5.99	47
14	73	0.87	7
15	49	0.58	5
16	28	0.33	3
17	267	3.19	25
18	58	0.69	5
19	26	0.31	2
20	71	0.85	7
Total	8,379	100.00	778

Note: Rounding may cause discrepancies in totals.

Swine Confinement Facility Assistant Manager

The total number of Illinois hog producers reporting swine sales in 1975 was 25,127.[1] Industry sources estimated that 25 percent of these producers (6,282) are confinement facilities, of which an estimated 10 percent (628) have a current need for assistant managers. It was also estimated that 150 confinement facilities currently employ an assistant manager, and that the growth rate of all confinement facilities requiring assistant managers; i.e., facilities with filled or unfilled assistant manager positions, yields 47 new positions due to expansion.

The five-year replacement rate for assistant managers was assumed to parallel the rate for farm foremen; i.e., ten percent. The ten-percent replacement rate was applied to the 150 assistant managers currently employed to obtain the number of openings due to replacement: 15. These calculations yield a current demand for assistant managers of 628, a five-year growth of 47 positions and 15 positions due to replacement, for a total of 690 openings over the next five years.

Regional estimates for assistant managers were based on the distribution of hog producers.[2] Each region's proportionate share was multiplied by 690 to obtain its requirements for assistant managers. The complete estimation process is illustrated in Table 8.

Table 8

Derivation of Projected Five-Year Employment Requirements for Swine Confinement Facility Assistant Manager

Region	Farms	Percent of State's Farms	Total Demand (1978-1983)
1	3,322	13.2	91
2	620	2.5	17
3	1,107	4.4	30
4	1,649	6.6	45
5	1,956	7.8	54
6	611	2.4	17
7	563	2.2	15
8	797	3.2	22
9	1,057	4.2	29
10	517	2.1	14
11	1,301	5.2	36
12	2,668	10.6	73
13	2,059	8.2	57
14	986	3.9	27
15	1,027	4.1	28
16	944	3.8	26
17	803	3.2	22
18	396	1.6	11
19	676	2.7	19
20	2,068	8.2	57
Total	25,127	100.0	690

Solar Energy Technician

Employment needs for solar energy technicians (SETs) were derived from (1) U.S. Department of Energy estimates of the current and projected number of solar homes in the United States, (2) the number of year-round housing units in Illinois and (3) the average amount of time required to design, install and maintain solar space and water heating systems. The U.S. Department of Energy estimates that there are 40,000 solar homes in the United States at the present time and that there will be 2.5 million solar homes by 1985.[3] This represents an 80-percent annual increase in the number of solar homes; by 1983 there will be approximately 750,000 solar homes in the country.

Illinois accounts for 5.5 percent of the year-round housing units in the United States.[4] Assuming it is representative of the rest of the United States in its current and projected use of solar energy for home heating purposes, it was estimated that within Illinois there are currently 2,183 solar homes and by 1983 there will be 41,250 solar homes in the State. During 1983, 18,333 solar heating systems will be installed in homes in Illinois.

To estimate the employment impact of this increase in the use of solar energy for home heating, figures from a Navarro College study of solar energy technology were used.[5] That study determined that the expected time required to design, install and maintain solar home heating systems was 10, 40 and 2 hours, respectively. The total design and installation time of 50 hours was divided into the number of work hours in a person year (2,080) in order to determine the number of solar heating systems that one SET could handle in a year (41.6). By dividing the number of systems that would be installed during the year 1983 (18,333) by the number of systems which one SET could design and install (41.6) an estimated 441 full-time SETs will be needed in 1983.

The number of SET positions which will be needed in 1983 in order to maintain the 41,250 solar heating systems was derived by multiplying the number of systems which will be in operation (41,250) by the number of hours per year required to maintain each system (2). This resulted in 82,500 SET hours needed for maintenance of systems in 1983. By dividing the number of hours required for maintenance (82,500) by the number of work hours in a person year (2,080), it was estimated that an additional 40 full-time SETs will be needed to maintain solar heating systems. When added to the number of SETs required to design and install systems (441), a total of 481 SETs will be needed by 1983.

To estimate the growth from present SET employment, it was assumed that all of the 2,183 existing solar homes were built in 1978. The number of SETs required to design, install and maintain the systems this year will be 55. Thus, the growth in SET employment from 1978 to 1983 is estimated to be 426.

The replacement rate for SETs was obtained by using the rate for plumbers and pipefitters, which is estimated to be 10 percent over for the next five years.[6] This figure was applied to the 1978 SET employment of 55 to yield 5 additional positions needed due to replacements. Thus the total growth and replacement needs for SETs between 1978-1983 is estimated to be 431.

The regional distribution of solar energy technicians in Illinois was assumed to follow that of plumbers and pipefitters. The figures used to estimate regional distribution of SETs is presented in Table 9.

[1] Illinois Cooperative Crop Reporting Service, *Illinois Agricultural Statistics: Assessors' Farm Census* (Springfield, IL: Illinois and U.S. Departments of Agriculture, 1976).

[2] *Ibid.*

[3] *Research Institute Recommendations*, Volume 29, Number 33 (New York, NY: The Research Institute of America, August 18, 1978).

[4] *Census of Housing*, Volume I, U.S. Bureau of the Census, 1970.

[5] *Assessment of Need for Developing and Implementing Technical and Skilled Worker Training For The Solar Energy Industry* (Corsicana, TX: Navarro College, January, 1978).

[6] *Illinois Manpower Projection*, op. cit.

Table 9

Derivation of Projected Five-Year Employment Requirements for Solar Energy Technician

Region	Plumbers/ Pipefitters	Percent of Total Employment	Total Demand (1978-1983)
1	1,064	4.19	18
2	16,305	64.14	276
3	401	1.58	7
4	655	2.58	11
5	316	1.24	5
6	1,047	4.12	18
7	292	1.15	5
8	1,069	4.21	18
9	260	1.02	4
10	527	2.07	9
11	811	3.19	14
12	184	0.72	3
13	1,188	4.67	20
14	213	0.84	4
15	169	0.66	3
16	85	0.33	1
17	411	1.62	7
18	94	0.37	2
19	131	0.52	2
20	197	0.77	3
Total	25,419	100.00	431

Note: Rounding may cause discrepancies in totals.

Table 10

Derivation of Projected Five-Year Employment Requirements for Halfway House Resident Manager

Region	Halfway Houses	Proportion of Total Houses	Total Demand (1978-1983)
1	5	.069	21
2	35	.486	146
3	2	.028	8
4	4	.056	17
5	4	.056	17
6	5	.069	21
7	1	.014	4
8	2	.028	8
9	1	.014	4
10	1	.014	4
11	4	.056	17
12	1	.014	4
13	2	.028	8
14	0	.000	0
15	0	.000	0
16	0	.000	0
17	2	.028	8
18	1	.014	4
19	0	.000	0
20	2	.028	8
Total	72	1.000	300

Note: Rounding may cause discrepancies in totals.

Halfway House Resident Manager

The estimation of employment demand for HHRM was based on the assumptions that (1) halfway house growth would be positively related to the present location of halfway houses, (2) the average tenure of HHRMs is two years and (3) halfway houses would increase at the rate of ten per year. The number of halfway houses known to the state agencies contacted was 97. The replacement of the managers of these facilities would require 242 new HHRMs. Growth of halfway houses over the next five years would require 50 additional managers. It was further assumed that at least eight of these 50 managers would be replaced by 1983. Thus, the total number of openings for HHRMs by 1983 is estimated to be 300.

The regional estimates were based on the proportion of halfway houses presently within each region. The proportion of 72 halfway houses (for which addresses were readily available) within each region was multiplied by 300. This operation yielded the estimated demand for HHRMs by region. The regional estimation procedure is presented in Table 10.

APPENDIX C

Organizations Contacted During the Survey

HEALTH

Program Area

American Academy of Occupational Medicine, Chicago, Illinois
American Association for Dental Research, Chicago, Illinois
American Association of Trauma Specialists, Chicago, Ilinois
American Dental Association, Chicago, Illinois
American Hospital Association, Chicago, Illinois
American Medical Association, Chicago, Illinois
American Medical Technologists, Park Ridge, Illinois
American Occupational Medical Association, Chicago, Illinois
American Osteopathic Association, Chicago, Illinois
American Society of Contemporary Medicine and Surgery, Chicago, Illinois
Council for Bio-Medical Careers, Chicago, Illinois
Illinois Chapter of the American Physical Therapy Association, Chicago, Illinois
Illinois Health Care Association, Springfield, Illinois
Illinois Hospital Association, Oakbrook, Illinois
Illinois Office of Education, Department of Adult, Vocational and Technical Education, Springfield, Illinois
Illinois Public Health Association, Springfield, Illinois
Illinois State Medical Society, Chicago, Illinois
National Health Council, New York, New York
State of Illinois Department of Public Health, Springfield, Illinois
U.S. DHEW, Public Health Service, Division of Resource Development, Chicago, Illinois

Alcoholism Counselor

American Medical Technologists, Chicago, Illinois
DePaul Rehabilitation Hospital, Milwaukee, Wisconsin
State of Illinois Alcoholism Division, Springfield, Illinois

Anesthesiologist Assistant

American Medical Association, Council on Medical Education, Chicago, Illinois
American Society of Anesthesiologists, Chicago, Illinois
Case-Western Reserve University, Cleveland, Ohio

Biological Photographer

Health Sciences Communications Association, Milbrae, California
National Health Council, New York, New York

Biomedical Equipment Technician

American Hospital Supply Corporation, McGaw Park, Illinois
Association for the Advancement of Medical Instrumentation, Arlington, Virginia
Hewlett-Packard Company, Chicago, Illinois
Oakton Community College, Morton Grove, Illinois
Palos Community Hospital, Palos Park, Illinois
Southern Illinois University, Carbondale, Illinois
Thornton Community College, South Holland, Illinois

Cardiopulmonary Technician

American Cardiology Technologists Association, Kensington, Maryland
Chicago Lung Association, Chicago, Illinois
Cook County Hospital Cardiology Unit, Chicago, Illinois
Illinois Masonic Medical Center, Chicago, Illinois
Michael Reese Medical Center, Chicago, Illinois
National Society of Cardiopulmonary Technologists, Kensington, Maryland
St. Mary's Hospital, Quincy, Illinois
William Rainey Harper College, Palatine, Illinois

Communication Aide

American Speech and Hearing Association, Rockville, Maryland
Illinois State Speech and Hearing Association, Mattoon, Illinois
Muldoon School, Rockford, Illinois
National Association for Hearing and Speech Action, Silver Spring, Maryland
National Health Council, New York, New York
Speech and Hearing Association of North Carolina, Duke University, Durham, North Carolina

Diagnostic Medical Sonographer

American Institute of Ultra-Sound in Medicine, Oklahoma City, Oklahoma
American Society of Ultra-Sound Technical Specialists, University Medical Center, Mobile, Alabama
Cook County Hospital Ultra-Sound Department, Chicago, Illinois
Loyola University Medical Center, Chicago, Illinois
Michael Reese Medical Center, Chicago, Illinois
St. Anne's Hospital, Chicago, Illinois
University of Chicago Medical Center, Chicago, Illinois
University of Illinois Medical Center, Chicago, Illinois

EEG Technician/Technologist

American Society of Electroencephalographic Technologists, Medical College of Georgia, Augusta, Georgia

Emergency Medical Technician

American Association of Trauma Specialists, Chicago, Illinois
National Registry of Emergency Technicians, Columbus, Ohio
National Safety Council, Chicago, Illinois
State of Illinois Emergency Medical Services, Springfield, Illinois

Expanded Function Dental Auxiliary

American Association for Dental Research, Chicago, Illinois
American Dental Assistants' Association, Chicago, Illinoid
American Dental Hygienists' Association, Chicago, Illinois
U.S. DHEW, Public Health Service, Division of Resource Development, Chicago, Illinois

Fundus Photographer

Baylor Medical School, Houston, Texas
Cook County Hospital, Ophthalmology Department, Chicago, Illinois
Illinois Association of Ophthalmology, Chicago, Illinois
Northwestern University Medical Center Eye Clinic, Chicago, Illinois
University of Illinois Medical Center, Chicago, Illinois

Geriatric Aide

Gerontology Resource Center, Chicago, Illinois
Illinois Health Care Association, Springfield, Illinois

Home Health Aide

American Hospital Association, Chicago, Illinois
State of Illinois Public Health Department, Springfield, Illinois

Horticultural Therapy Technician

Botanical Consultants, Inc., Deerfield, Illinois
Charles County Community College, LaPlata, Maryland
Chicago Botanical Gardens, Chicago, Illinois
Illinois State University, Normal, Illinois
Iowa Lakes Community College, Emmetsburg, Iowa
Morton Arboretum, Lisle, Illinois
National Council for Therapy and Rehabilitation through Horticulture, Mount Vernon, Virginia
St. Louis Community College at Meramec, Kirkwood, Missouri
Virginia Polytechnical Institute, Blacksburg, Virginia

Industrial Hygiene Technologist

American Industrial Hygiene Association, Akron, Ohio
Argonne National Laboratories, Argonne, Illinois
National Institute of Occupational Safety and Health, Cincinnati, Ohio
Occupational Health Institute, Inc., Chicago, Illinois
Occupational Safety and Health Administration (OSHA), Chicago, Illinois
Olin Corporation, New Haven, Connecticut
Standard Oil Company, Chicago, Illinois
Triton College, River Grove, Illinois
U.S. Civil Service Commission, Chicago, Illinois

Multi-competency Technician

American Hospital Association, Chicago, Illinois
Southern Illinois University, Carbondale, Illinois

Nephrology

American Association of Nephrology Nurses and Technicians, Chicago, Illinois
College of DuPage, Glen Ellyn, Illinois
Gambro, Inc., Chicago, Illinois
Lakeland Community College, Mentor, Ohio
Malcolm X College, Chicago, Illinois
North Central Dialysis Center, Chicago, Illinois
Office of U.S. Senator Jesse Helms, Raleigh, North Carolina
Research Triangle Institute, Research Triangle Park, North Carolina
Rockford Memorial Hospital, Rockford, Illinois
State Coordinator for End Stage Renal Disease, Springfield, Illinois

Nuclear Medicine Technologist

American Society of Radiologic Technologists, Chicago, Illinois
Children's Memorial Hospital, Chicago, Illinois
Illinois Hospital Association, Oakbrook, Illinois
Methodist Hospital, Indianapolis, Indiana
Nuclear Medicine Society, New York, New York
St. Anthony's Hospital, Rockford, Illinois
St. John's Hospital, Springfield, Illinois
Triton College, River Grove, Illinois

Ophthalmic Technician

American Association of Certified Allied Health Personnel in Ophthalmology, (Doris Gaston, (602) 939-1987)
Chicago Board of Education, Chicago, Illinois
Children's Memorial Hospital, Chicago, Illinois
Dr. Burton Krimmer, Chicago, Illinois
Dr. Samuel Schall, Chicago, Illinois
Joint Commission on Allied Health Personnel in Ophthalmology, St. Paul, Minnesota
National Health Council, New York, New York

Optometric Technician/Assistant

American Optometric Association, St. Louis, Missouri
National Health Council, New York, New York

Pediatric Assistant

American Academy of Pediatrics, Chicago, Illinois
American Association of Medical Assistants, Chicago, Ilinois
Chicago Shriners Hospital, Chicago, Illinois
Children's Memorial Hospital, Chicago, Illinois
National Health Council, New York, New York
Shriners Hospitals National Office, Chicago, Illinois
University of Illinois, Champaign, Illinois

Pharmacy Technician

Illinois Pharmaceutical Association, Chicago, Illinois
National Health Council, New York, New York

Physician's Assistant

American Academy of Physician's Assistants, Arlington, Virginia
Illinois Hospital Association, Chicago, Illinois
Loop College, Chicago, Illinois

Podiatric Assistant

Biomechanics Research Lab, Des Plaines, Illinois
Dr. Lowell Weil, Chicago, Illinois
Illinois College of Podiatric Medicine, Chicago, Illinois
Illinois Podiatry Society, Chicago, Illinois
Podiatry Medical Center, Springfield, Illinois

Profusion Technologist

American Medical Association, Council on Medical Education, Chicago, Illinois
American Society of Extracorporeal Technology, Chicago, Illinois
Mercy Hospital, Urbana, Illinois

School Health Aide

State of Illinois Department of Public Health, Family Health Division, Springfield, Illinois
State of Illinois Office of Education, Springfield, Illinois

Therapeutic Recreation Technician

Moraine Valley Community College, Palos Hills, Illinois
National Parks and Recreation Association: National Therapeutic Recreation Society, Arlington, Virginia
Parkland College, Champaign, Illinois
San Jose State University, Department of Leisure Studies, San Jose, California
Triton College, River Grove, Illinois
University of Illinois, Department of Leisure Studies, Urbana, Illinois
University of Maryland, Department of Recreation, College Park, Maryland

Tumor Registrar

American Cancer Society, Chicago, Illinois
American Cancer Society, North Carolina Division, Raleigh, North Carolina
American Cancer Society, Springfield, Illinois
American Medical Records Association, Springfield, Illinois
Chicago Tumor Registrars Association, Chicago, Illinois
Memorial Medical Center, Springfield, Illinois
Michael Reese Hospital, Chicago, Illinois
National Tumor Registrars Association, Mercy Hospital, Toledo, ohio
U.S. DHEW, Division of Associated Health Professions, Hyattsville, Maryland

Veterinary Assistant

American Veterinary Medical Association, Schaumberg, Illinois
Illinois State Veterinary Medical Association, Aurora, Illinois
Parkland College, Champaign, Illinois

APPLIED BIOLOGY AND AGRICULTURE

Program Area

American Agriculturalist, Ithaca, New York
American Dairy Association, Rosemont, Illinois
American Dairy Science Associates, Champaign, Illinois
American Farm Bureau Federation, Chicago, Illinois
American Forest Institute, Mt. Prospect, Illinois
American Society of Animal Science, Champaign, Illinois
American Society of Farm Managers and Rural Appraisers, Denver, Colorado
Cornell University, Ithaca, New York
Country Companies Insurance, Bloomington, Illinois
Dean Foods Company, Rockford, Illinois
Farm and Industrial Equipment Institute, Chicago, Illinois
Farm Foundation, Oak Brook, Illinois
Farm Industry News, St. Paul, Minnesota
Farm Journal, Champaign, Illinois
Farm Progress Publications, Oak Brook, Illinois
Farm Research Institute, Urbana, Illinois
Fyster Farm Equipment, Bloomington, Ilinois
Hutchinson Farm Management, Genesco, Illinois
Illinois Department of Agriculture, Springfield, Illinois
Illinois Farm Bureau, Bloomington, Illinois
Illinois State University, Agricultural Occupations Education Joint Staff; Department of Agriculture, Normal, Illinois
Poultry Science Association, Champaign, Illinois
Society for the Study of Reproduction, Champaign, Illinois
Southern Illinois University, School of Agriculture, Carbondale, Illinois
U.S. Occupational Safety and Health Administration, Peoria, Illinois
University of Illinois, Agricultural Extension Service; Departments of Agronomy and Agricultural Engineering, Urbana, Illinois
Weed Science Society, Champaign, Illinois
Western Illinois University, Department of Agriculture, Macomb, Illinois
WGN Radio, Chicago, Illinois

Forest Recreation Technician

National Parks Service, Washington, D.C.
State of Illinois Department of Conservation, Forestry and Public Lands Sections, Springfield, Illinois
Southern Illinois University, Forestry Department, Carbondale, Illinois
U.S. Department of the Interior, Heritage Conservation and Recreation Service, Washington, D.C.
U.S. Forest Service, Washington, D.C.

Pest Management

Departments of Agronomy and of Entomology, University of Illinois, Urbana, Illinois
Farm Progress Publications, Oak Brook, Illinois

Swine Confinement Facility Assistant Manager

Black Hawk College, Kewanee, Illinois
Kishwaukee College, Malta, Illinois
Illinois Pork Producers Association, Springfield, Illinois
Milt Holcomb (consultant), Champaign, Illinois
University of Illinois, Agriculture Extension Service and Department of Agricultural Engineering, Urbana, Illinois
Western Illinois University, Department of Agriculture, Macomb, Illinois
Wilbur Paulos (owner), Lincoln, Illinois

BUSINESS, MARKETING AND MANAGEMENT

Program Area

American Vocational Association, Washington, D.C.
American Federation of Small Business, Chicago, Illinois
American Marketing Association, Chicago, Illinois
Foodservice Equipment Distributors Association, Chicago, Illinois
Illinois CPA Society, Chicago, Illinois
Illinois Department of Labor, Chicago, Illinois
Illinois Hotel and Motel Association, Springfield, Illinois
Illinois Manufacturers Association, Chicago, Ilinois
Market Research Corporation of America, Chicago, Illinois
National Association of Retail Grocers of the United States, Oak Brook, Illinois
National Appliance and Radio-TV Dealers Association, Chicago, Illinois
National Business Education Association, Reston, Virginia
National Office Machine Dealers Association, Elk Grove Village, Illinois
National Secretaries Association, Kansas City, Missouri
Office Education Association, Columbus, Ohio
Retail Clerks Union AFL/CIO Local Number 1550, Chicago, Illinois
Retail, Wholesale, and Department Store Union, AFL/CIO Local Number 291, Chicago, Illinois
Supervisors of Word Application and Processors, Springfield, Illinois
U.S. DOC, Census Bureau, Washington, D.C.
U.S. DOL, Employment and Training Administration, Washington, D.C.

Computer Tape Librarian

Allstate Insurance Company, North Brook, Illinois
Computer Dealers Association, Chicago, Illinois
Computer Sciences Corporation, Oak Brook, Illinois
Computer Software Associates, Chicago, Illinois
Computer Software Systems, Inc., Chicago, Illinois
Data Entry Management Association, Greenwich, Connecticut
Data Processing Management Association, Park Ridge, Illinois
IBM, Commercial Division, Chicago, Illinois

Media Equipment Technician

Illinois Office of Education, Springfield, Illinois

Para Accountant

American Institute of CPA's, New York, New York
Illinois CPA Society, Springfield, Illinois
National Association of Accountants, New York, New York

Paralegal Aide

Illinois Community College Board, Springfield, Illinois
Lewis and Clark Community College, Godfrey, Illinois

INDUSTRIAL

Program Area

American Nuclear Society, LaGrange, Illinois
American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., New York, New York
American Waterway Operators, Arlington, Virginia
Chicago Association of Commerce and Industry, Chicago, Illinois
Chicago Building Trades Council, Chicago, Illinois
Computer Industry Association, Arlington, Virginia
Educational Foundation for Nuclear Science, Chicago, Illinois
Illinois Association of County Board Members, Springfield, Illinois
Illinois Chamber of Commerce, Chicago, Illinois
Illinois Coal Operators Association, Springfield, Illinois
Illinois Department of Transportation, Division of Water Resources, Springfield, Illinois
Illinois Manufacturers Association, Chicago, Illinois
Institute of Environmental Sciences, Mt. Prospect, Illinois
Institute of Gas Technology, Chicago, Illinois
Midwest Industrial Management Association, Westchester, Illinois
National Association of Industrial Technology, Jacksonville, Florida
Refrigerating Engineers and Technicians Association, Chicago, Illinois
SCNO Barge Line, St. Louis, Missouri
U.S. DOC Maritime Administration, Washington, D.C.
U.S. DOE, Manpower Assessment Division, Washington, D.C.

Automotive Electronics Technician

American Motors Corporation, Detroit, Michigan
Automotive Service Councils, Inc., Elmhurst, Illinois
Equipment and Tool Institute, Glenview, Illinois
Ford Motor Company, Detroit, Michigan
Schoolcraft Community College, Detroit, Michigan

Chemical Spill Control Technician

Division of Water Pollution, Illinois Environmental Protection Agency, Springfield, Illinois
Hulcher Emergency Services, Virden, Illinois
Illinois Pollution Control Board, Chicago, Illinois
National Spill Control School, Corpus Christi State University, Corpus Cristi, Texas
Rychman's React, St. Louis, Missouri
U.S. Environmental Protection Agency, Chicago, Illinois

Chromotography Technician

Illinois Environmental Protection Agency, Springfield, Illinois
Randolph and Associates, Peoria, Illinois

Crystal Manufacturing

Century Solar Engineering, Bensonville, Illinois
CTS Knights, Inc., Sandwich, Illinois
Edmund Scientific Company, Chicago, Illinois
Electronic Memories and Magnetics Corporation, Des Plaines, Illinois
GTE Automatic Electric, Chicago, Illinois
General Electric Company, King of Prussia, Pennsylvania
Illinois Manufacturers Association, Chicago, Illinois
Solar Dynamics, Northfield, Illinois
Solar Products, Rockford, Illinois
Texas Instruments, Dallas, Texas
Western Electric Company, Inc., Chicago, Illinois

Electro-mechanical Technician

Joilet Junior College, Joilet, Illinois
Lake Land College, Mattoon, Illinois

Energy Efficiency Technician

American Society of Heating, Refrigerating and Air Conditioning Engineers, New York, New York
Association of Energy Engineers, Atlanta, Georgia
Association of Physical Plant Directors in Colleges and Universities, Washington, D.C.
Association of Plumbing, Heating, and Cooling Contractors, Inc., Rockford, Illinois
Borg-Warner Corporation, Chicago, Illinois
Builders Association of Chicago, Chicago, Illinois
Building Managers Association of Chicago, Chicago, Illinois
Century Solar Engineering, Bensonville, Illinois
Consulting Engineers Council of Illinois, Springfield, Ilinois
Elec Association of Chicago, Chicago, Illinois
Gamze, Korobking, Gallager, Inc., Chicago, Ilinois
Greer Technical Institute, Chicago, Illinois
Heating-Piping-Air Conditioning, Chicago, Illinois
Illinois Association of Plumbing, Heating, and Cooling Contractors, Inc., Springfield, Illinois
Illinois Institute of Technology, Chicago, Illinois
Illinois Regional Insulation Contractors Association, Inc., Chicago, Illinois
North Carolina State University, School of Engineering, Raleigh, North Carolina
Refrigerating Engineers and Technicians Association, Chicago, Illinois
Solar Products, Rockford, Illinois
U.S. DOE, formerly Energy Research and Development Administration, Chicago, Illinois

Heat and Power Engineer

Association of Physical Plant Directors in Colleges and Universities, Washington, D.C.
Building Management Corporation, Chicago, Illinois
Building Managers Association of Cchicago, Chicago, Ilinois
Building Owners and Managers Association, Washington, D.C.
Building Service Employees International Union, Local No. 189 of AF of L, Chicago, Illinois
Electrical Association of Chicago, Chicago, Illinois
Heating-Piping-Air Conditioning, Chicago, Illinois
National Association of Power Engineers, Chicago, Illinois

Laser/Electro-Optics Technician

Bell and Howell, Chicago, Illinois
Brooks Engineering Company, Chicago, Illinois
Carl Lambrecht, Chicago, Illinois
Caterpillar Tractor, Peoria, Illinois
Electro-Optical Systems Design Magazine, Chicago, Illinois
Gaertner Scientific Corporation, Chicago, Illinois
FJW Industries, Mt. Prospect, Illinois
International Harvester, Hinsdale, Illinois
North Central Technical Institute, Wausau, Wisconsin
OpticalSociety of America, Washington, D.C.
Technical Education Research Center, Waco, Texas
Texas State Technical Institute, Waco, Texas

Nuclear Occupations:

Nuclear Instrumentation Technician
Nuclear Materials Processing Technician
Nuclear Qualified Welder
Nuclear Quality Assurance Inspector
Power Reactor Technician
Radiation Protection Technician

American Nuclear Society, LaGrange, Illinois
Commonwealth Edison, Chicago, Illinois
Illinois Commerce Commission, Public Utilittties, Springfield, Illinois
Illinois Power Company, Chicago, Illinois

Mech-Tronics Nuclear Corporation, Chicago, Illinois
Nuclear Diodes, Inc., Prarie View, Illinois
Nuclear Energy Services, Inc., Rosemont, Illinois
Nuclear Power Outfitters, Crystal Lake, Illinois
Union Electric Power Company, St. Louis, Missouri
U.S. Nuclear Regulatory Commission, Chicago, Ilinois

Nuclear Qualified Welder (contacts specifically for)
American Welding Society, Miami, Florida
Carolina Power and Light Company, Raleigh, North Carolina
Hobart School of Welding Technology, Troy, Ohio

Nuclear Quality Assurance Inspector (contacts specifically for)
American Society for Quality Control, Milwaukee, Wisconsin
A Nuclear-Chicago Corporation, Chicago, Illinois
Idaho-National Engineering Laboratories, Idaho Falls, Idaho
Baldwin Associates, Clinton, Illinois
Chicago Bridge and Iron Company, Chicago, Illinois
Oak RIDGE Associated Universities, Oak Ridge, Tennessee
Sargent and Lundy, Chicago, Illinois
Stone and Webster, Boston, Massachusetts

Safety Technician
American Society of Safety Engineers, Park Ridge, Illinois
Association of Federal Safety Employees, Williamstown, New Jersey
Illinois Department of Insurance, Springfield, Illinois
Illinois Department of Labor, Chicago, Illinois
Illinois Department of Mines and Minerals, Springfield, Illinois
National Institute for Occupational Safety and Health, Cincinnati, Ohio
National Loss Control Service Corporation, Long Grove, Illinois
National Safety Council, Chicago, Illinois
Pebble Beach Corporation, WedronSilica Division, Park Ridge, Illinois
R.T. Daley Community College, Chicago, Illinois
U.S. Bureau of Mines, Springfield, Illinois
U.S. Occupational Safety and Health Administration, Chicago, Illinois

Solar Energy Technician
Association of Plumbing, Heating, and Cooling Contractors, Inc., Rockford, Illinois
Century Solar Engineering, Bensonville, Illinois
Colorado State University, Fort Collins, Colorado
Illinois Association of Heating, Plumbing, and Cooling Contractors, Inc., Springfield, Illinois
Illinois Department of Business and Economic Development, Division of Energy, Springfield, Illinois
Illinois Institute of Technology, Chicago, Illinois
Oak Ridge Associated Universities; Manpower Education, Research and Training Division; Oak Ridge, Tennessee
Plumbers and Pipefitters Union, Local No. 99, Bloomington, Illinois
Solar Construction Company, Wood Dale, Illinois
Solar Division of International Harvester, Chicago, Illinois
Solar Dynamics, Northfield, Illinois
Solar Products, Rockford, Illinois
U.S. DOE, formerly Energy Research and Development Administration Office, Chicago, Illinois
U.S. DOE, Manpower Assessment Program; Education Programs Division; Washington, D.C.

PERSONAL AND PUBLIC SERVICE

Program Area
American Bankers Association, Washington, D.C.
American Dietetic Association, Chicago, Illinois
American Home Economics Association, Washington, D.C.
American Institute of Baking, Chicago, Illinois
American Public Works Association, Chicago, Illinois
American Society of Bakery Engineers, Chicago, Illinois
American Society of Traffic and Transportation, Chicago, Illinois
Association for Food Service Management, Rolling Meadows, Illinois
Child Care Association of Illinois, Springfield, Illinois
Home Economics in Business, McLean, Virginia
Home and People Services, Springfield, Illinois
Hospital, Institution, and Educational Food Service Society, Chicago, Illinois
Institute of Food Technologists, Chicago, Illinois
Illinois Department of Children and Family Services, Springfield, Illinois
Illinois Department of Corrections, Springfield, Illinois
Illinois Department of Mental Health, Chicago, Illinois
Illinois Department of Public Aid, Springfield, Illinois
Illinois Municipal League, Springfield, Illinois
International Home Furnishings Representatives Association, Chicago, Illinois
International Institute of Food and Family Living, Chicago, Illinois
Marketing Agents for Food Service Industry, Chicago, Illinois
National Council for Homemaker-Home Health Aide Services, New York, New York
National Home Furnishings Association, Chicago, Illinois
National Recreation and Parks Association, Arlington, Virginia
National Restaurant Association, Chicago, Illinois
Needlework and Textile Guild of Chicago, Chicago, Illinois
Society of Consumer Affairs Professionals, Washington, D.C.
University of Illinois, Department of Human Resources and Family Services, Urbana, Illinois
University of Illinois, Department of Recreation and Park Resources, Urbana, Illinois

Child Advocate
Child Advocate Association, Chicago, Illinois
Children, Family and Youth Advocacy Council, Belleville, Illinois
Illinois Commission on Children, Springfield, Illinois
Illinois Department of Children and Family Services, Springfield, Illinois
Illinois Developmental Disability Advocacy Authority, Springfield, Illinois
North Carolina Child Advocacy Council, Raleigh, North Carolina
State of Illinois Department of Corrections, Advocacy Services, Aurora, Illinois

Dietetic Technician
American Dietetic Association, Chicago, Illinois

Halfway House Resident Manager
Association of Rehabilitation Facilities, Illinois Chapter, Springfield, Illinois
DeKalb County Villages, DeKalb, Illinois
DePaul University, Chicago, Illinois
Illinois Alcoholism and Drug Dependence Association, Springfield, Illinois
Illinois Association for Retarded Citizens, Chicago, Illinois
Illinois Department of Children and Family Services, Springfield, Illinois
Illinois Department of Corrections, Chicago, Illinois

Illinois Department of Mental Health and Developmental Disabilities, Springfield, Illinois
Illinois Housing Development Authority, Chicago, Illinois
Southern Illinois University, Carbondale, Illinois

Housing Rehabilitation Specialist

Avondale Savings and Loan Association, Chicago, Illinois
Beverly Bank, Chicago, Illinois
Chicago Department of Urban Renewal, Chicago, Illinois
Decatur Department of Community Development, Decatur, Illinois
First Federal Savings of Chicago, Chicago, Illinois
First National Bank of Chicago, Chicago, Illinois
Housing Assistance Council, Washington, D.C.
Illinois Housing Development Authority, Chicago, Illinois
Mayor's Home Rehabilitation Office, Chicago, Illinois
National Association of Housing and Redevelopment Officials, Washington, D.C.
Neighborhood Housing Service, Chicago, Illinois
Chicago Area Renewal Effort Service Corporation (RESCORP), Chicago, Illinois
Rockford Department of Community Renewal, Rockford, Illinois
Springfield Office of Community Planning and Programs, Springfield, Illinois
U.S. DHUD, Community Planning and Development, Chicago, Illinois
Urban Reinvestment Task Force, Chicago, Illinois

Physical Security Technician

American Society for Industrial Security, Washington, D.C.
Bullis Security Systems, Chicago, Illinois
Forest Alarms, Chicago, Illinois
Harrison and Walsh Management Consultants, New Rochelle, New York
Industrial Alarm Systems, Chicago, Illinois
Mt. Clemens Community College, Mt. Clemens, Michigan
Police Training Institute, University of Illinois, Urbana, Illinois
Property Loss Research Bureau, Chicago, Illinois
United Fire Equipment Service Association, Bensonville, Illinois

Public Safety Communications Operator

Chicago Police Department, Chicago, Illinois
Illinois Commerce Commission, Springfield, Illinois
Illinois Emergency Services and Disaster Agency, Springfield, Illinois
Lakeland Community College, Mattoon, Illinois
The Associated Public-Safety Communication Officers, Inc., New Smyrna Bech, Florida

Recoverable Materials Coordinator

American Public Works Association, Chicago, Illinois
Chicago Department of Streets and Sanitation, Chicago, Illinois
Illinois Environmental Protection Agency, Division of Land Pollution, Springfield, Illinois

Security Officer for Airports

O'Hare International Airport, Chicago, Illinois
U.S. Federal Aviation Agency, Chicago, Illinois

Wastewater Treatment Plant Technician and Operator

Illinois Environmental Protection Agency, Division of Water Pollution, Springfield, Illinois